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TRANSACTIONS

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AMERICAN ENTOMOLOGICAL SOCIETY

VOLUME LX

NOTES ON A COLLECTION OF HETEROPTERA TAKEN IN WINTER IN THE VICINITY OF LOS ANGELES, CALIFORNIA

BY W. S. BLATCHLEY

Indianapolis, Indiana

In the winter of 1927–1928 I spent three and a half months in Los Angeles, California. While there I collected insects, mainly Coleoptera and Heteroptera, when opportunity offered. The collecting was done mostly in Griffith, Elysian and Hancock Parks, Los Angeles. Several day trips were made to other near-by stations and a longer one, with a number of scientists from the Experiment Station at Riverside, to the Salton Sea depression southeast of Indio. As the only extended list of the Heteroptera of Southern California which has come to my notice is that of Mr. E. P. Van Duzee entitled "A Preliminary List of the Hemiptera of San Diego Co., California,"[1] it will perhaps be of interest to future collectors in the region mentioned to have access to a list of the species of Heteroptera taken in and about Los Angeles between November 25 and March 15.

In the list which follows the number in parenthesis preceding the scientific name is the serial number of the species in the Van Duzee "Catalogue of the Hemiptera of America North of

[1] Trans. San Diego Soc. Nat. Hist., II., pp. 1–57.

Mexico." Where the species has been described since the Van Duzee Catalogue was issued, a citation to the place of original description is given in a footnote. My thanks are due Mr. Van Duzee and Mr. H. G. Barber for aid rendered in the identification of a number of the species. A series of specimens from the material upon which this paper is based is deposited in the collection of The American Entomological Society.

1 (11). **Stethaulax marmoratus** (Say)

Three specimens taken at Griffith Park, November 28 and February 21, by beating oak and pine foliage. While this is recognized by Van Duzee as Say's species it differs in several important characters from the eastern form,[2] and may represent the *S. simulans* of Uhler (1876, 272), described from California, which Van Duzee makes a synonym of *marmoratus*.

2 (13). **Sphyrocoris punctellus** (Stal)

One male was swept from wild sunflower, February 17, near the Hot Springs, four miles north of San Jacinto. Recorded from California only from San Diego County but found in numbers by Van Duzee on wild cotton on Cerallvo Island, Gulf of California.

3 (18). **Homæmus variegatus** Van Duzee

One specimen beaten from oak November 28 at Griffith Park. Described from San Diego and recorded only from there.

4 (36). **Corimelæna extensa** Uhler

A single example was beaten from chaparral, February 1st on a slope at the same park. It is a species of wide range.

5 (45). **Macroporus repetitus** Uhler

Two were taken at Griffith Park, December 9 to March 8. Described from San Francisco. Recorded also from San Diego County and San Gabriel, California.

6 (48). **Aethus testudinatus** (Uhler)

One was found, January 13, beneath a clump of dead weeds just above high tide on the beach at Santa Monica. Originally described from California but no definite station record has since been made from that State.

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[2] See footnote page 45 of my "Heteroptera of Eastern North America."

7 (56). **Pangæus discrepans** Uhler

One, taken February 26, from beneath a stone on the edge of a stream near Sunland. Described from San Diego. Ranges as far east as Indiana.

8 ( ). **Pangæus californicus** Blatchley[3]

The type, a female, was taken January 10, from beneath a stone in a small, semi-desert area near Sunland, Los Angeles County. Other unnamed specimens are in the collection of the California Academy of Sciences, labelled "San Diego, Cal., IV—8, and Cold Water Canyon, Los Angeles Co., Cal., X—4." This species is most closely allied to *P. discrepans*, from which it differs in its larger size (9.3 to 10 as against 6.5 to 8 mms.); lack of punctures or distinct groove behind apex of pronotum, much fewer and more regularly placed bristles on cheeks and along side margins of pronotum and elytra, smoother disks of pronotum and corium, etc.

9 (87). **Brochymena tenebrosa** Walker

Two were beaten, February 18, from the foliage of a creosote bush in the old bed of the Salton Sea, about 15 miles southeast of Indio.

10 ( ). **Brochymena sulcata** Van Duzee[4]

One beaten from a pepper tree, December 6, in Hancock Park.

11 (109). **Chlorochroa sayi** Stal

Found frequently, December 1 to March, hibernating beneath piles of weeds. One was beaten from juniper February 11. Varies in general color from pale brown to bright green. Readily known from its close allies by the three small ivory-white spots on the base of scutellum.

12 (122). **Euschistus conspersus** Uhler

This is a rather common bug about Los Angeles in winter. Adults were beaten from the flowers of shrubs on February 21 and March 1, and nymphs were noted beneath piles of weeds on numerous occasions. It occurs throughout the State and it and *E. crenator* (Fabr.) appear to be the only two of the 18 known North American species of the genus, recorded from California.

[3] Entomological News, 1929, p. 74.

[4] Proc. Cal. Acad. Sci., (4), VIII, p. 276.

13 (148). **Neottiglossa cavifrons** Stal

A single example of this handsome little pentatomid was beaten from a flowering shrub at Griffith Park on February 21. It ranges east to southern Indiana, but is nowhere common, and in California has been definitely recorded only from Mt. Diablo Park, Cloverdale and Placerville.

14 (158). **Thyanta custator** Fabricius

This widely distributed bug was taken on numerous occasions during the winter, by sweeping grasses and weeds on vacant lots, beating flowering shrubs, etc.

15 (164). **Thyanta punctiventris** Van Duzee

Two examples of this small species were taken, December 22 and January 13; one from a bunch of dead grass near Hancock Park, the other from beneath weed debris at Santa Monica beach. It ranges east to Nebraska and North Dakota. No previous definite station record from California can be found.

16 (165). **Thyanta brevis** Van Duzee

A single example was beaten February 18 from a creosote bush at Salton Sea. Recorded from several localities in San Diego County and Lower California.

17 (172). **Murgantia histrionica** (Hahn)

This, the well known "harlequin cabbage bug," was the first and one of the most common pentatomids that I saw while at Los Angeles. It occurred in all stages during the winter on wild mustard and other cruciferous plants along the streets and in vacant lots. The specimens taken all differ from those of the eastern states in being larger and much darker, with a different pattern of the reddish and black colors, and the name *nigricans*[5] Cockerell which Van Duzee relegates to synonymy, should probably be retained for it as a distinct color variety.

18 (227). **Podisus maculiventris** (Say)

This, the widely distributed "soldier bug," is apparently scarce about Los Angeles in winter. One specimen was beaten from juniper in Hancock Park on March 6.

19 (247). **Leptoglossus occidentalis** Heidemann

A single example of this western species was taken February 11

[5] Bull. So. Cal. Acad. Sci., II, 1903, p. 85.

by beating from the same clump of juniper. No previous definite station from the State can be found.

20 ( ). **Chariesterus balli** Fracker[6]

This species has heretofore been known only by two specimens from Cabazon, California, the type locality. A single example was taken February 17 from wild sunflower growing on a slope near the Hot Springs, four miles north of San Jacinto.

21 (289). **Margus inconspicuus** (Herrich-Schaeffer)

This is another western species heretofore recorded only indefinitely from California. Two specimens were taken February 17 from the same clump of sunflowers near the Hot Springs.

22 (301). **Anasa tristis** (DeGeer)

This, the "common squash bug," was taken frequently at Hancock Park and Elmonte from beneath piles of weeds and other winter cover. It ranges throughout the United States.

23 (341). **Aufeius impressicollis** Stal

A rather common form, taken on several occasions at Griffith Park and Elmonte, by beating dead tumbleweed (*Amaranthus* sp.), and branches of oak and living apple and walnut trees. Ranges east to Indiana and Ohio.

24 (343). **Corizus hyalinus** (Fabricius)

Taken several times at Hancock and Griffith parks by beating juniper and from beneath piles of weeds.

25 (347). **Corizus validus** Uhler

A single example of this large western species was taken February 17 from the clump of sunflowers at Hot Springs.

26 (348). **Corizus lateralis** (Say)

One was swept from tall grasses in a slough near the club house at Griffith Park. Judging from the few records it is apparently scarce in California.

27 (352). **Corizus indentatus** Hambleton

A single specimen was taken February 26 from beneath bark of eucalyptus near Sunland.

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[6] Ann. Ent. Soc. Amer., XII, 1919, p. 229.

28 (354). **Corizus parvicornis** Signoret

This little hairy species was taken in numbers on several occasions by sifting weed debris at Hancock Park, Santa Monica Beach and Elmonte. No definite station from the State is on record.

29 ( ). **Aradus depictus** Van Duzee[7]

A single male was taken February 7 from beneath bark of a shrub at Griffith Park. It has been previously known only from the two type examples, one from Niles Canyon, Alameda County, the other from the hills near Claremont.

30 (406). **Mezira mœsta** Stal

One sifted, March 8, from the debris of a wood rat's nest at Griffith Park. Known also from several localities about San Francisco.

31 (419). **Neides muticus** (Say)

Taken on several occasions from beneath logs at Elysian and Griffith Parks. Occurs throughout the United States.

32 (426). **Acanthophysa echinata** Uhler

A single example of this little bristly stilt-bug was beaten, February 1, from a clump of dead vines at Griffith Park. It was originally described from the Argus Mts., Death Valley, and from near Los Angeles and has since been recorded from several other California stations. Of it Uhler says: "This most remarkable insect might perhaps be confounded with the prickly seed vessel of some of the sand ticks or beggars lice which grow in sandy places."

33 (437). **Lygæus kalmii** Stal

This is a common bug about Los Angeles in winter. On sunny days it occurs on the foliage of weeds and juniper. At other times it is found beneath piles of grass or rubbish. Ranges almost throughout the United States.

34 (452). **Lygæus bicrucis** Say

Taken in Elysian Park on several occasions on flowers of Compositae, and at Sunland, February 26, beneath stones. It is also a species of wide but more southern distribution than *kalmii*.

[7] Proc. Cal. Acad. Sci., (4), VII, 1917, p. 253.

35 (462). **Ortholomus scolopax** (Say)

One specimen beaten, March 1, from sage-brush on hillside at Elysian Park. Recorded from San Diego and San Mateo counties as *O. longiceps* Stal, a synonym. Occurs throughout the United States.

36 (463). **Ortholomus nevadensis** Baker

One was beaten from wild sun-flower at Hot Springs. Recorded from San Diego County and Nevada.

37 (464). **Ortholomus arphnoides** Baker

This is one of the most common winter bugs about Los Angeles, occurring in numbers on dead weeds in vacant lots and on chaparral on the foot hill-slopes. Taken also at Hot Springs. Recorded only from California.

38 (466). **Nysius californicus** Stal

But two specimens were taken, both at Elysian Park, one from sage-brush, the other from flowers of *Viburnum*. It is a common species in Florida and other southern states.

39 (470a). **Nysius ericæ minutus** Uhler

Very common on sage-brush on the foot-hill slopes at Elysian and Griffith parks; also swept frequently from green herbage on vacant lots of the city. It is much smaller than typical *ericae* (Schill.) of the eastern states, and will probably prove to be a distinct species.

40 (472). **Nysius strigosus** Uhler

Taken from sage-brush with the preceding, also at Hot Springs and in the bed of the old Salton Sea near Indio. Described from San Julio, Lower California. Ranges east to Florida.

41 (478). **Ischnorrhynchus franciscanus** (Stal)

But three specimens were taken, all at Griffith Park by beating clumps of dead vines. Van Duzee records it as common in summer on chaparral in San Diego County.

42 (498). **Geocoris punctipes** (Say)

Frequent beneath clumps of dead weeds in vacant lots; also at Santa Monica beach. Ranges east through the southern states to Maryland and New Jersey.

43 (502). **Geocoris uliginosus** (Say)

One, December 3, from beneath a pile of weeds in Hancock Park.

44 (529). **Heræus coquilletti** Barber

A single specimen, February 28, from beneath a board near Hancock Park. Barber's types were from Stanford University, California and Texas. Recorded also as *H. nitens* VanD., a synonym, from Alpine and Leona Heights, California.

45 (568). **Cnemodus sobrius** Uhler

Frequent in November and February at Griffith Park beneath stones, bark of decaying wood and other cover. All specimens taken were of the brachypterous form. Described from Lower California. Not definitely recorded elsewhere.

46 ( ). **Thylochromus nitidulus** Barber

A single brachypterous specimen of this new genus and new species[8] was taken at Griffith Park, March 8, by sifting the debris of the nest of a yellow wood-rat, *Neotoma intermedia gilva* Rhodes. The macropterous type and a number of brachypterous individuals were taken by Barber along the Arroyo Seco Canyon near Pasadena in March and April, 1928, and others at Griffith Park by sifting dead leaves. He records also a single specimen from Harbison Canyon, San Diego County.

47 (571). **Ozophora depicturata** Barber[9]

A half dozen specimens were taken from the same rat's nest on the same date. The type of Barber and a number of paratypes were taken at the same place. He also records it from several localities in Arizona, and states that: "It is rather closely related to *O. picturata* Uhl., but is relatively longer and with the corium differently marked; the lateral margins of the pronotum much less evidently expanded; the head longer in relation to its width across the eyes."

48 ( ). **Plinthisus pallidus** Barber

One, January 27, beaten from willow at Elysian Park. This minute yellowish species was described[10] from Los Angeles and is not recorded elsewhere.

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[8] Bull. Brookl. Ent. Soc., xxiii, 1928, p. 264.

[9] Bull. Brookl. Ent. Soc., xxiii, 1928, p. 266.

[10] Proc. Ent. Soc. Wash., xx, 1918, p. 111.

49 (587). **Peritrechus tristis** Van Duzee

Taken on several occasions during the winter from beneath matted clumps of grass and by beating juniper in and near Hancock Park. Recorded from Alpine, California. Ranges north to Vancouver, British Columbia.

50 (592). **Sphragisticus nebulosus** (Fallen)

Two were beaten, December 28, from a dead tumble-weed (*Amaranthus*) near Elmonte. Ranges throughout the United States.

51 (597). **Emblethis vicarius** Horvath

One, December 6, at Hancock Park, another at Elmonte, December 28, both beneath clumps of weed debris. Also a species of very wide range.

52 (601). **Eremocoris inquilinus** Van Duzee

Twenty or more were sifted, March 8, from the big nest of the wood-rat in Griffith Park. Van Duzee's types were taken in May, near San Diego, from a similar nest. Not recorded elsewhere.

53 (603). **Togodolentus wrighti** (Van Duzee)

Three were taken, March 8, from the same rat's nest at Griffith Park. Described from San Diego as an *Eremocoris*. Barber founded for his *T. genuinus*,[11] a synonym of *wrighti*, the genus *Togodolentus*. His type of *genuinus* was from Los Angeles. Recorded heretofore only from the two type localities.

54 (613). **Scolopostethus tropicus** Distant

Taken on several occasions by sifting weed debris at Griffith and Hancock parts and Elmonte. Described from Guatemala. Recorded by Van Duzee from San Diego, Fosters and Grossmont.

55 (636). **Piesma cinerea** (Say)

This little lace bug was taken near Hancock Park on several occasions by beating dead *Amaranthus*, one of its host plants. It ranges across the continent.

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[11] Journ. N. Y. Ent. Soc., xxvi, 1918, p. 64.

56 ( ). **Corythucha bullata** Van Duzee

Beaten in numbers, March 10, from the purple flowers of a "mountain lilac," (*Ceanothus* sp.?) on the slopes of the Ojai valley. Described[12] from San Diego and Los Altos, California, and not recorded elsewhere.

57 ( ). **Corythucha confraterna** Gibson

One, January 23, by beating holly in Sycamore Park. Described[13] from Los Angeles, Chico and Santa Barbara, California.

58 (648¾). **Corythucha eriodictyonæ** Osborn & Drake

One, November 29, by beating the foliage of sycamore in Griffith Park. Described from San Mateo County, California.

59 ( ). **Empicoris rubromaculata** (Blackburn)

On December 9, this little "thread-legged" bug was beaten by scores and in all stages from dead tumble-weed (*Amaranthus*) in a meadow, south of the picnic stand at Griffith Park. It was also taken from dead walnut brush at Elmonte. Originally described from Hawaii, it has been recorded from numerous stations in this country as far east as Indiana and Virginia. The *Ploiariodes californica* Banks (No. 699 of the Van D. Catalogue) is a synonym.

60 ( ). **Empicoris orthoneuron** McAtee & Malloch

This species, described[14] from Monterey and Santa Cruz, California, was taken on a number of occasions, November 30–January 18, from piles of grass, weeds and brush in vacant lots near Hancock Park. Recorded heretofore only from the type localities.

61 (740). **Triatoma protracta** (Uhler)

One adult and numerous nymphs in various stages of this "cone-nose" were sifted, March 8, from the nest of the wood rat at Griffith Park. Van Duzee records it as common at San Diego in nests of the same rodent. Described from Santa Cruz and San Diego.

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[12] Proc. Cal. Acad. Sci., VII, 1917, p. 258.
[13] Trans. Amer. Ent. Soc., XLIV, 1918, p. 102.
[14] Proc. U. S. Nat. Mus., LXVII, 1925, p. 18.

62 (750). **Sirthenea carinata** (Fabricius)

Two nymphs were taken in December, one on a sidewalk, the other beneath a board near Hancock Park. It is a species of wide range, but adults, for some reason, are very scarce.

63 (764). **Apiomerus crassipes** (Fabricius)

One nymph, presumably of this species, was taken from beneath debris at the base of a sycamore in Griffith Park.

64 (770). **Zelus cervicalis** Stal

A single example, February 26, was beaten from a shrub in an arroya near Sunland. It is a species of wide range but without definite station records from California.

65 (800). **Sinea diadema** (Fabricius)

One, December 3, swept from herbage in a vacant lot. Also a common species of wide range.

66 (808). **Sinea rileyi** Montandon

One, February 23, beaten from shrub oak in Griffith Park. The last three species are all doubtless common about Los Angeles in spring and summer.

67 ( ). **Nabis edax** Blatchley[15]

The male type was taken December 6 by sifting debris beneath a pile of matted grass in Hancock Park. It differs from all our other described species in its nearly uniform pale color, relative length of the very slender antennal segments, etc.

68 (843). **Lyctocoris stalii** (Reuter)

A single example was taken, January 3, by sifting debris from beneath a pile of grass near Hancock Park. There is no station record from California. It ranges east to New York.

69 (859). **Anthocoris antevolens** White

This was a common species on willow throughout the winter in all the parks.

70 (864). **Orius insidiosus** (Say)

On sunny days the typical form of this little bug and its color variety, *O. tristicolor* White, were both common on the flowers

[15] Ent. News, XL, 1929, p. 75.

and herbage of various plants. Both have a wide range. The generic name, *Orius* Wolff, has priority over *Triphleps* Fieber.

71 ( ). **Cardiastethus cavicollis** species nova

Oblong-oval. Dark reddish-brown, the margins of pronotum and elytra slightly paler, cuneus fuscous-brown, membrane hyaline, transparent, antennae with first joint, basal half of second and all of fourth, yellow, remainder fuscous; legs yellow. Pronotum with median transverse groove deep, entire and with a longitudinal groove extending from its middle back to the deeply concave basal margin. Basal half of pronotum densely and deeply punctate, corium finely and sparsely so, each puncture of the latter bearing a very fine appressed hair. Length 2.5 mm.

Type.—Male; beaten, February 21, from leaves of a dead oak in Griffith Park.

Paratype.—Male; taken January 13, from beneath a bunch of weeds just above high water line at Santa Monica Beach.

Resembles *C. assimilis* (Reut.) but larger and with sculpture of pronotum very different.

72 (871). **Dufouriellus ater** (Dufour)

Taken on several occasions at Griffith Park and near Sunland from beneath the close fitting bark of dead willows and English walnut. It is a palæarctic species of wide distribution.

73 (926). **Phytocoris canescens** Reuter

Taken in numbers throughout the winter by beating sage brush on the foot hill slopes of both Elysian and Griffith parks. The brachypterous form was much the more common.

74 (945). **Phytocoris ramosus** Uhler

A single specimen was beaten February 18 from a creosote bush at the edge of the Salton Sea depression. Originally described from Cape St. Lucas, San Bernardino and Los Angeles.

75 ( ). **Phytocoris calvus** Van Duzee

One taken with the preceding; two from sage brush at Elysian Park. Described[16] from a single male taken on Mt. Wilson near Los Angeles; not recorded elsewhere.

76 ( ). **Phytocoris geniculatus** Van Duzee

One, February 18, also from a creosote bush at the same locality. Several others were seen.

[16] Proc. Cal. Acad. Sci., (4), IX, 1920, p. 343.

77 (956). **Phytocoris vanduzeei** Reuter

Two specimens taken from creosote bush near the Salton Sea depression.

78 ( ). **Phytocoris** sp.?

Two, taken January 27, by beating sage brush on the hill slopes near Elysian Park.

79 ( ). **Irbisia californica** Van Duzee[17]

Very common in February and March, on grass and other herbs in the parks and vacant lots. Described from numerous stations in southern and central California.

80 ( ). **Irbisia cuneo-maculata** species nova

Regularly oval, subconvex. Above black, shining, thickly clothed with a fine, prostrate whitish pubescence; basal third of cuneus with a large oblique yellowish-white spot; membrane dusky translucent, the nervule and margins paler; legs and middle of under surface yellow; antennae dark brown, basal joint paler. Head between the eyes finely granulose-punctate; basal two-thirds of pronotum unevenly convex, densely rather coarsely rugose-punctate; clavus and corium more finely and closely punctate, each puncture bearing a single prostrate very fine hair. Length 4.2 mm.

Type.—Brachypterous female; beaten, February 26, from a white flowered shrub near Sunland. Smaller, more oval and more convex than our other described species and the only one with a large pale spot on cuneus.

81 (1024). **Lygus apicalis** Fieber

Two examples of this large green species were taken, January 27, and February 21, by sweeping flowers of "everlasting" (*Gnaphalium*) at Griffith Park. It is a cosmopolitan species ranging from New England to Florida, Texas and California, and usually breeds on the horse-weed, *Leptilon canadense* (L.).

82 (1027). **Lygus sallei** Stal

One was beaten, January 13, from a bunch of living prostrate weeds on the beach at Santa Monica. It was recorded by Van Duzee from San Diego and ranges east and north to Colorado.

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[17] Proc. Cal. Acad. Sci. (4), XI, 1921, p. 146.

83 (1032). **Lygus elisus** Van Duzee

This insect, and its color variety *viridiscutus* Knight, were the most common Mirids noted during the winter. They were taken in numbers on various occasions by sweeping green herbage in the vacant lots of the city and at Elmonte.

84 (1038¼). **Lygus nubilus** Van Duzee

Taken in some numbers in February by beating willow and elderberry in Elysian and Griffith parks. Described from San Diego but known also as far north as Sunol, Alameda County.

85 (1087). **Clivinema villosa** Reuter

One beaten February 18, from a creosote bush on the edge of the Salton Sea depression. Known from Colorado and Arizona but not before recorded from California.

86 (1112). **Engytatus geniculatus** Reuter

Abundant in all stages, January 13, on and beneath a fleshy leaved prostrate herb growing just above high tide on beach at Santa Monica. Not before recorded from California, but mentioned by Uhler (1894, 274) as occurring at Comondu and Magdalena Island, Lower California. A smaller and paler form, taken with this on the beach at Santa Monica, is probably *E. simplex* (Reut.).

87 (1135). **Tiryus punctulatus** (Reuter)

One taken December 22, by beating a bunch of dead grass near Hancock Park. Not before recorded from the State, though specimens are at hand from Walnut Creek and Napa, California which were taken by R. L. Usinger.

88 ( ). **Ceratocapsus proximus** species nova

Oblong-oval, widest behind the middle. Pale brownish-yellow, sparsely clothed with long, inclined yellowish-hairs; antennae with apical joint dusky. Pronotum trapezoidal, but slightly wider at base than long at middle, disk finely sparsely punctate, calli obvious but not prominent. Elytra reaching sixth dorsal, finely and thickly punctate, tips subtruncate, cuneus poorly differentiated, membrane scarcely evident. Antennae with first joint three-fourths as long as width of vertex, second three times the length of first, third two-fifths the length of second, fourth one-half as long as third. Length 2.3 mm.

Type.—A brachypterous female; beaten, December 7, from dead amaranth in Hancock Park.

89 ( ). **Hadronema uhleri** Van Duzee

One example of this recently described[18] species was beaten from sage brush on the hill slope at Elysian Park. Van Duzee's types were from Alpine, San Diego County. Not elsewhere recorded.

90 (1169¾). **Orthotylus ferox** Van Duzee

Beaten in some numbers, January 10, from elder and a shrubby Compositæ at Sunland; also February 17 from wild sunflower at Hot Springs. Described from San Diego County. Easily known by its pale green hue and numerous bristly black hairs of the upper surface.

91 (1173½). **Orthotylus uniformis** Van Duzee

Common, February 18, on sage brush along the border of Salton Sea depression. Described from near Lake Tahoe, California, Arizona and New York.

92 (1199½). **Parthenicus picicollis** Van Duzee

Three were taken and a number of others seen on the foliage of a creosote bush February 18 near the border of the Salton Sea; several others were taken in February at Sunland and Griffith Park by beating the foliage of shrubby Compositæ. Described from San Diego County; not recorded elsewhere.

93 ( ). **Parthenicus ruber** Van Duzee

Frequent, February 18, on creosote bush near Salton Sea. Very active, most of them flying from the beating umbrella and escaping capture. Described[19] from Placer County, Sisson and Mt. Tamalpais.

94 (1242). **Plagiognathus breviceps** Reuter

Common in February and March on the foliage and blossoms of a white flowered shrub at Griffith Park. Recorded by Van Duzee as very common near San Diego.

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[18] Pan Pacific Entomologist, IV, 1928, p. 182.

[19] Proc. Cal. Acad. Sci., VII, 1917, p. 276.

95 ( ). **Plagiognathus** sp.?

Several specimens taken in January and February from sage brush on the slope of hill at Elysian Park.

96 (1253). **Europiella decolor** (Uhler)

Frequent from January 18 to March 15, on foliage and flowers of shrubs on the slopes of the parks; also on willow and beneath bark. From the records it is apparently a common form in southern California.

97 (1272). **Rhinocloa forticornis** Reuter

Taken on several occasions in December by sweeping roadside herbage and from beneath bunches of grass. Recorded from San Diego but appears scarce in California, though common in the southern states farther east.

98 ( ). **Psallus** sp.?

One, March 8, from a white flowered shrub at Griffith Park.

99 (1283). **Gerris remigis** Say

Frequent and mating, January 23, in pools in Los Angeles River near Sycamore Park. Widely distributed in North America.

100 (1307). **Microvelia americana** (Uhler)

Frequent with the preceding, but concealed among masses of water weed. It is also a species of wide distribution.

101 (1308). **Macrovelia hornii** Uhler

One adult and several nymphs were taken February 17 at Hot Springs, from beneath a board on the side of a ditch of running sulphur water; others in all stages, March 11, beneath cover in a runway near the reservoir at Elysian Park. Uhler's types were in part from California, but no previous definite station record from that State can be found.

102 (1404). **Abedus dilatatus** (Say)

Several nymphs were taken, February 17, from a pool at the foot of a water-fall near Hot Springs; an adult carrying numerous eggs on its back was found March 1, in the runway at Elysian Park. Originally described from Mexico. Recorded from near San Diego.

STUDIES IN THE AMERICAN HESPERIOIDEA

PAPER II[1]

(LEPIDOPTERA)

BY ROSWELL C. WILLIAMS, JR. AND ERNEST L. BELL

(Plate I)

ON THE SYNONYMY AND GENITALIA OF SOME SPECIES

Goniurus reductus (Riley) (Pl. I, fig. 8)

1919. *Eudamus reductus* Riley, The Entomologist, LII, p. 201. [Hyutanahan, Labrea, Rio Purus; Ega.]

The single male specimen before the writers was photographed and a copy sent to Capt. N. D. Riley who has confirmed the identification as *reductus*. The form of the genitalia is similar to that of the other species in the *doryssus* group but the apex of the terminal arm of the claspers is much more sharply pointed in this individual than in the allied species.

Goniurus erycina (Plotz) (Pl. I, fig. 11)

1881. *Eudamus erycina* Plotz, Stett. Ent. Zeit., XLII, p. 503. [Brazil.]
1922. *Thymele erycina* Draudt, in Seitz Macrolep., V, p. 867. (Not pl. 168 a.)

This is apparently a very rare insect in collections. A photograph of a male in the Bell Collection was sent to Capt. Riley who compared it with the copy of the Plotz drawing in the British Museum and confirms that it is the Plotz species. The text in Seitz Macrolepidoptera may refer to this insect but the figure certainly does not agree with either the Plotz description or his figure. The anal angle of the primaries is produced into a short, triangular hook and the secondaries have short, broad tails, the fringes of both wings are broadly black at the end of the veins and white or yellowish between them, at the vein ends they are a little lengthened giving the wings a crenulate appearance on the outer margin. The basal area of both wings is a brilliant blue.

[1] Paper I. Trans. Am. Ent. Soc., LIX, p. 69–84, (1933).

The female is similar to the male but with the secondaries noticeably broader. Although quite different in superficial appearance, the form of the genitalia is similar to that found in the *doryssus* group and for this reason and the fact of the short tails of the secondaries the insect seems better placed among the *Goniurus* than in *Telegonus* although it must occupy a unique position in that genus. The specimens at hand are from Massaranduba-Blumenau and Mafra, Santa Catharina, Brazil.

Codatractus cyledis (Dyar) (Pl. I, fig. 2)

1912. *Heteropia cyledis* Dyar, Proc. U. S. Nat. Museum, XLII, p. 42. [Mexico.]
1922. *Heteropia cyledis* Draudt, in Seitz Macrolep., V, p. 860, pl. 171 d.

The long, slender termination of the uncus distinguishes this species from either *bryaxis* Hewitson or *melon* Godman & Salvin in the form of the genitalia, the claspers being rather similar in all three species though differing slightly. The extensive ochreous coloring of the upper side of the wings readily distinguishes *cyledis* from the other species except perhaps *cyda* Godman, which, however, differs on the underside of the secondaries.

Chrysoplectrum bahiana (Herrich-Schaffer) (Pl. I, fig. 5)

1869. *Eudamus bahiana* Herrich-Schaffer, Corresp.-blatt. d. zool.-min. Ver. Regensb., XXIII, p. 185. [No locality given.]
1882. *Eudamus bahiana* Plotz, Stett. Ent. Zeit., XLIII, p. 89. [Bahia.]
1902. *Telegonus hurga* Schaus, Proc. U. S. Nat. Museum, XXIV, p. 427. [Peru.]
1906. *Thymele pervivax* var. *alexanderi* Weeks, Psyche, XIII, p. 71; 1911, Illustr. Diurnal Lep., II, p. 15, pl. 9. [Suapure, Venezuela.]
1922. *Chrysoplectrum otriades* form *bahiana* Draudt, in Seitz Macrolep., V, p. 862, pl. 167 a.
1922. *Thymele pervivax aleanderi* Draudt, in Seitz Macrolep., V, p. 866.

The uncus terminates in two, long, slender arms with a short flange on each side projecting obliquely downward. The scaphium is well developed. The aedoeagus is somewhat bent and carries a number of serrations at the apex. The claspers are asymmetrical and very irregular in shape, with numerous small serrations at the apex and on the dorsal edge.

Telegonus anaphus (Cramer)

1779. *Papilio anaphus* Cramer, Pap. Exot., II, p. 126, pl. 178, fig. F. [Surinam.]
1912. *Telegonus anaphus* form *anaphides* Mabille & Boullet, Ann. Sci. Nat., Zool., (9), XVI, p. 75. [Brazil.]

Anaphus is subject to considerable variation in depth of ground color of the wings and in the extent of the yellow coloring in the anal area both above and beneath, which recedes until it becomes entirely absent. The extreme form, lacking all of the yellow area and certain phases of the variation which can be definitely associated with the geographical distribution are of course worthy of distinctive names but the intermediate forms, and *anaphides* is considered to be one of these, do not seem to deserve to be so distinguished.

Telegonus anaphus form **alpistus** Mabille

1903. *Telegonus alpistus* Mabille, Gen. Insect., XVII, p. 25. [Santa Catharina.]

This form lacks the yellow anal angle area above and beneath. The specimens at hand are a little smaller than the average *anaphus*. There are specimens in the collection of the American Museum of Natural History from Peru and a male in the Bell Collection from British Guiana.

Telegonus anaphus race **anausis** Godman & Salvin

1896. *Telegonus anausis* Godman & Salvin, Proc. Zool. Soc. London, 1896, p. 519. [St. Vincent; Grenada.]

1902. *Thymele grenadensis* Schaus, Proc. U. S. Nat. Museum, XXIV, p. 427. [Grenada.]

This race is similar to the form *alpistus* but has a much darker ground color of the wings and in the specimens at hand the fringes of the secondaries are brown, including the anal angle where a few yellow scales may be intermixed.

Telegonus anaphus race **cubana** Mabille & Boullet

1912. *Telegonus alpistus* var. *cubana* Mabille & Boullet, Ann. Sci. Nat., Zool., (9), XVI, p. 77. [Cuba.]

1927. *Telegonus cubana* Williams, Trans. Amer. Ent. Soc., LIII, p. 281, pl. 24, fig. 5.

Cubana differs from the race *anausis* Godman & Salvin in having the fringes at the anal angle of the secondaries pale yellow. There are specimens in the collection of the Academy of Natural Sciences of Philadelphia, from Sierra Maestra, Eastern Cuba; Haiti; Isle of St. Thomas; Jamaica.

Telegonus elorus (Hewitson) (Pl. I, fig. 3)

1867. *Eudamus elorus* Hewitson, Descr. One Hundred New Spec. Hesp., (1), p. 10. [No locality given.]
1903. *Telegonus pheres* Mabille, Genera Insect., XVII, p. 26. [Brazil.]
1922. *Telegonus elora* Draudt, in Seitz Macrolep., V, p. 863, pl. 167 b.
1922. *Telegonus pheres* Draudt, in Seitz Macrolep., V, p. 864, pl. 167 e.

The description of *pheres* indicates that the name is synonymous with *elorus* and this is further confirmed by Capt. Riley in a letter to the writers stating that *pheres* and *elorus* are the same insect as shown by the material in the Mabille Collection.

The form of the male genitalia is similar to that of *anaphus* Cramer but the aedoeagus has two clusters of internal spines instead of one and the apex of the claspers is produced into a more slender triangle.

Telegonus halesius (Hewitson)

1877. *Eudamus halesius* Hewitson, Ann. & Mag. Nat. Hist., (4), XX, p. 321. [Cayenne.]
1891. *Thymele anthius* Mabille, Ann. Soc. Ent. Belg., XXXV, C. R., p. lxi. [Hunyabamba.]

The original descriptions of *halesius* and *anthius* agree very well in the characters of the maculation. The type of *anthius* is not in the Mabille Collection, in the British Museum, but presumably in Berlin, we are informed by Capt. Riley. The species seems to be very rare in collections, there is a single male specimen in the Bell Collection, from Ecuador.

In the male genitalia the uncus terminates in two slender arms, pointed at the apex. There is a short scaphium. The aedoeagus carries a single, large, internal spine. The terminal arm of the clasper has a bluntly triangular apex, the dorsal edge produced backward into a stout, serrate hook; at about the center of the base of the terminal arm is another shorter hook directed inwardly toward the disc of the clasper. A figure of the genitalia will be given in a later paper.

Telegonus apastus (Cramer)

1779. *Papilio apastus* Cramer, Pap. Exot., II, p. 22, pl. 111, figs. D, E. [Surinam.]
1893. *Telegonus apastus* Godman & Salvin, Biol. Centr.-Amer., Rhop., II p. 310, pl. 72, fig. 23. (Male genitalia.)
1922. *Telegonus apastus* Draudt, in Seitz Macrolep., V, p. 864, pl. 168 c. (As *briccius* Plotz; not pl. 167 e.)
1927. *Telegonus briccius* Williams, Trans. Amer. Ent. Soc., LIII, p. 276. (? Not Plotz.)

Godman & Salvin appear to have correctly identified this species. Draudt seems to refer to it correctly in the text but the figure he gives for *apastus* is apparently that of some other species, while his figure of *briccius* Plotz well represents *apastus*. The writers are uncertain as to the identity of *briccius* but the Plotz description does not very well agree with *apastus* and it appears to be more closely related to *aulestes*. In some individuals of *apastus* the fringes of the secondaries are distinctly checkered but in others they are entirely dark. It is rather peculiar that the form of the male genitalia of *apastus* is very similar to that found in *anaphus* Cramer and allied species while the insect itself has a very different superficial appearance.

Telegonus mura Williams

1927. *Telegonus mura* Williams, Trans. Amer. Ent. Soc., LIII, p. 276, pl. 25, fig. 1, p. 275, fig. 17. (Male genitalia.) [Manicore, Rio Madeira, Brazil.]

The unique type has a discal band of four hyaline spots on the primaries, the costal spot minute and the other three rather small and well separated. A male specimen in the collection of the American Museum of Natural History which agrees with the type in the form of the genitalia, has a discal band of five hyaline spots all larger than in the type, the fifth spot lying in interspace 3 above the outer angle of the spot in interspace 2. This specimen is from the Putumayo River region of Peru.

Telegonus tristis (Draudt) (Pl. I, fig. 13)

1922. [*Thymele*] *tristis* Draudt, in Seitz Macrolep., v, pl. 168 b.

There are specimens of this species in both the Academy and Bell Collections. Draudt figured *tristis* but failed to mention it in the text.

A slide has been made of the male genitalia, from a specimen from Chanchamayo, Peru, in the Bell Collection. The uncus terminates in two, slender, pointed arms. There is a well developed, and partly shagreened scaphium. The aedoeagus is simple. The clasper has a very short terminal arm turned abruptly upward into a long, slightly curved hook, heavily covered with short teeth.

Telegonus creteus (Cramer)

1782. *Papilio creteus* Cramer, Pap. Exot., III, p. 162, pl. 284, figs. C, D. [Surinam.]
1876. *Eudamus oenander* Hewitson, Ann. & Mag. Nat. Hist., (4), XVIII, p. 350. [Para.]
1903. *Telegonus siges* Mabille, Genera Ins., XVII, p. 26. [Brazil.]

The description of *oenander* indicates a typical *creteus*, of which, Capt. Riley informs us, there is no specimen in the Hewitson Collection, nor is there any specimen under the name *oenander*.

Siges likewise is merely one of the numerous forms of this very variable species, in which the metallic color of the wing base is more green than blue and the white area on the underside of the primaries is reduced and broken up into spots. Specimens from southern Brazil show the white area of the underside of the primaries more or less reduced and broken up into spots and these specimens are merely transitional to the form also occurring in the extreme southern part of the range of the species in which the white area entirely disappears.

Telegonus hahneli (Staudinger) (Pl. I, fig. 9)

1888. *Aethilla hahneli* Staudinger, Exot. Schmett., p. 291, pl. 98. (As *Thymele cassander* Fabricius.) [Venezuela.]
1893. *Telegonus hahneli* Godman & Salvin, Biol. Centr.-Amer., Rhop., II, p. 306, pl. 77, figs. 13, 14.
1922. *Telegonus hahneli* Draudt, in Seitz Macrolep., V, p. 863, pl. 167 b, c.
1931. *Telegonus hahneli* Holland, But. Book, 2nd. Ed., p. 333, pl. 49, fig. 19.

The form of the male genitalia is similar to that of *anaphus* Cramer but the apical part of the terminal arm of the claspers is produced into a more elongate triangle.

Telegonus cretellus (Herrich-Schaffer) (Pl. I, fig. 10)

1869. *Eudamus cretellus* Herrich-Schaffer, Corresp.-blatt. d. zool.-min. Ver. Regensb., XXIII, p. 185. (Prodr. Syst. Lep., p. 65.) [No locality given.]
1870. *Aethilla jariba* Butler, Trans. Ent. Soc. London, 1870, p. 496. [Cuba.]
1874. *Aethilla jariba* Butler, Lep. Exot., p. 111, pl. 40, fig. 3.
1882. *Aethilla cretellus* Plotz, Berlin Ent. Zeit., XXVI, p. 259; (t. 220). [Cuba.]
1907. *Telegonus cretellus* Godman, Ann. & Mag. Nat. Hist., (7), XX, p. 134.
1912. *Telegonus cretellus* Mabille & Boullet, Ann. Sci. Nat., Zool., (9), XVI, p. 80.
1916. *Telegonus geronae* Holland, Ann. Carnegie Mus., X, p. 503.
1917. *Telegonus creteus* form *cretellus* Draudt, in Seitz Macrolep., V, p. 863.

In his paper, Herrich-Schaffer divided the genus *Eudamus* into two groups, the first equal to *Goniurus* Hubner and the second, as *Eudamus* proper, containing a number of insects which are now distributed in several of the modern genera. The second group was again divided into two parts, the first including insects now placed in the genera *Chrysoplectrum*, *Aguna* and *Telegonus* and is the section with which we are concerned in this case.

This section is characterised by "Base of all wings and the body haired green or bluish" and is again divided into groups of species, those having hyaline spots on the primaries and a white transverse band on the secondaries beneath; those having the hyaline spots but no band; those having no hyaline spots, and it is with this last group that we are concerned. The species included are brought together; first, those having "On the underside of the primaries a white doubled spot somewhat before the center of the costa" and includes *pseudochalybe* Herrich-Schaffer and *xagua* Lucas as well as *bahiana* Herrich-Schaffer separated from the other two by having a yellow, instead of white, costal marginal spot; second, those having "On the underside of the primaries no light spot on the center of the costa" and includes *cretellus* Herrich-Schaffer and *creteus* Cramer, *cretellus* distinguished by "Underside without markings," and *creteus* by "Underside with a feebly paler stripe on the hindwings in the outer ¾ from cell 1c toward the costa. Forewings with a broad, whitish inner border"; third, those having "Underside with from ¼ to ⅙ of the outer border lighter" and includes *habana* Lucas, *alardus* Stoll, *latimargo* Herrich-Schaffer with a white or "violet-gray" outer border of the secondaries beneath and *elorus* Hewitson with a paler brown border of both wings beneath, and *bifascia* Herrich-Schaffer having "Fringes of the secondaries brown, underside with two broad, darker, irregular, transverse bands through all wings."

While Herrich-Schaffer's descriptions are very brief, they definitely state certain characters of maculation distinguishing these insects and his names will have to be applied to insects agreeing with those he has given and not to insects which disagree with the descriptions, as has been done by subsequent authors.

Plotz placed *jariba* Butler, a Cuban insect, as a synonym of *cretellus* Herrich-Schaffer, referring to his drawing no. 220. Plotz had an excellent opportunity to identify the Herrich-Schaffer species and his action appears to be correct. Herrich-Schaffer, as is well known, had much Cuban material and described new species of *Lepidoptera* from that Island and it is not unreasonable to assume that his *cretellus* may have been received by him among that material. The description of *cretellus* fairly well agrees with the insect usually known as *jariba* Butler, which has the bluish hairing of the base of the wings much reduced but present in variable extent in the males and a little more prominently so in the females, the underside of the wings is without distinct markings as compared with *creteus*, with which Herrich-Schaffer associated *cretellus*.

Godman compared specimens with the Plotz drawings and refers to drawing no. 89 as *cretellus*, saying that of the two figures present, one appeared to be *jaira* Butler and the other very much like *chiriquensis* Staudinger. However, Plotz in his published papers refers his drawing no. 89 to *bifascia*, which he places as a synonym of *creteus*; drawing no. 220 to *cretellus*; and drawing no. 217 to *jaira*. Just how this confusion in regard to drawing no. 89 came about can hardly be explained now but it seems possible that Plotz in his later writings corrected the errors on his unpublished drawings. The insect referred to by Godman as resembling *chiriquensis* does not agree with the description of *cretellus* but does agree with that of *bifascia*, and the other appearing to be *jaira* does not disagree with the description of *cretellus*, but *jaira* is a Jamaican insect and it seems to be most probable that Herrich-Schaffer's species was the Cuban one, which is further supported by the fact that Plotz recognised both *cretellus* and *jaira* and applied the first name to the Cuban insect.

Despite the fact that Mabille & Boullet claim to have seen a specimen of *cretellus* in the Herrich-Schaffer Collection we believe that they are mistaken in their identification as the characters of maculation which they give do not agree with the Herrich-Schaffer description and very evidently apply to *creteus*, which Herrich-Schaffer definitely separated from *cretellus* in his paper.

Draudt has apparently followed Mabille & Boullet as he places *cretellus* Herrich-Schaffer as a form of *creteus* and includes *cretellus* Plotz in the synonymy of *jaira* Butler.

The form of the male genitalia is similar to that of *hahneli*, differing slightly in detail as shown in the accompanying figures.

Telegonus jaira (Butler)

1870. *Aethilla jaira* Butler, Trans. Ent. Soc. London, 1870 p. 496. [West Indies.]
1872. *Aethilla jaira* Butler, Lep. Exot., p. 110, pl. 40, fig. 11.
1927. *Telegonus jariba* race *jamaicensis* Williams, Trans. Amer. Ent. Soc., LIII, p. 282, pl. 24, figs. 6 and 25. (♂ genitalia.)

While *jaira*, the Jamaican insect, is very closely related to *cretellus*, the Cuban one, the difference in the shape of the terminal point of the clasps, long and projecting in *cretellus* and short and blunt in *jaira*, leads us to keep them as separate species.

Telegonus bifascia (Herrich-Schaffer)

1869. *Eudamus bifascia* Herrich-Schaffer, Corresp.-blatt. d. zool.-min. Ver., Regensb., XXIII, p. 185. (Prodr. Syst. Lep. p. 65.) [No locality given.]
1882. *Eudamus bifascia* Plotz, (as synonym of *creteus* Cramer), Stett. Ent. Zeit., XLIII, p. 90; (t. 89). [Brazil; Jamaica.]
1912. *Telegonus bifascia* Mabille & Boullet, Ann. Sci. Nat., Zool., (9), XVI, p. 80.

As stated under *cretellus* Herrich-Schaffer, *bifascia* is distinguished in the description by the fringes of the secondaries being brown, the underside of the wings with two brown bands, broad and irregular, and a lighter outer margin of the secondaries.

Plotz has evidently mistaken *bifascia* for one of the *creteus* forms found in southern Brazil in which the white area of the primaries beneath is absent and which sometimes has the outer margin of the secondaries beneath slightly paler than the rest of the wing.

The writers have not seen this insect from Jamaica, as recorded by Plotz, but as he also lists *jaira* from the "Antilles" it is evident that it is not that insect to which he refers. Godman & Salvin, (Biologia, p. 308) state that they collected a specimen of *chiriquensis* Staudinger at Moneague, Jamaica in 1861, and it may be possible that it was an insect of this description which Plotz mistook for a *creteus* form, this being further supported by Godman's statement that one of the figures on the drawing no. 89 examined by him was very much like *chiriquensis*.

Mabille & Boullet, we believe, have also misidentified *bifascia*, as the characters of maculation given in their paper disagree with the Herrich-Schaffer description and apparently apply to a

creteus form. Capt. Riley informs the writers that the specimen of *bifascia* in the Mabille Collection agrees with the *creteus* form from southern Brazil.

Capt. Riley has very generously loaned the writers a series of specimens in this group, among which is the specimen which Godman compared with the Plotz drawing no. 89 and which agreed with the figure resembling *chiriquensis*. This insect is, however, not *chiriquensis* Staudinger, differing therefrom in the less rounded outer margin of the secondaries, and on the underside of those wings in the much narrower yellowish outer marginal band and in the abdominal fold being entirely dark colored as far as the extreme point of the anal angle, in typical *chiriquensis* the anal angle is entirely yellowish.

Bifascia closely resembles the Biologia figure of *grullus* Mabille (Plate 77, fig. 18, underside). *Grullus* is, of course, an entirely different insect, and has a white marginal band which is not well shown in the figure referred to, as it shows the band pale yellowish in all of the copies of the Biologia we have seen. Among the specimens sent by Capt. Riley is one agreeing with the specimen from which the Biologia figure was taken and this specimen has the marginal band white and not yellowish.

The form of the male genitalia is similar to that found in the other species in this group.

There are male specimens of *bifascia* in the Bell and the Academy Collections from San Christobal, Chiapas, Mexico and others in the Academy Collection from Chiriqui; Gatun, Canal Zone; Palenque, Mexico.

Calliades phrynicus (Hewitson) (Pl. I, fig. 7)

1867. *Eudamus phrynicus* Hewitson, Descr. One Hundred New Spec. Hesp., (1), p. 19. [St. Paulo, Amazon.]

1888. *Thymele viridans* Mabille, Le Naturaliste, (2), II, p. 170, fig. 8. [Amazon.]

1912. *Calliades phrynicus* Mabille & Boullet, Ann. Sci. Nat., Zool., (9), XVI, p. 109, 110.

1922. *Calliades phrynicus* Draudt, in Seitz Macrolep., V, p. 868, pl. 186 e.

The form of the male genitalia very much resembles that of certain of the species of *Goniurus*, especially in the uncus and the upward projection at the termination of the claspers. The aedoeagus is rather short and thick.

There is a female in the Academy Collection from Iquitos, Peru. It is distinguished from the female of *zeutus* by the wide yellowish-white outer margin of the secondaries above.

Calliades zeutus (Moschler) (Pl. I, fig. 4)

1878. *Cecropterus zeutus* Moschler, Verh. d. k.-k. z.-b. Ges. Wien, XXVIII, p. 229. [Colombia.]
1882. *Cecropterus koluthos* Plotz, Berlin Ent. Zeit., XXVI, p. 261. (Unpublished drawing t. 228.) [Colombia.]
1901. *Thymele polias* Godman, Biol. Cent.-Amer., Rhop., II, Suppl., p. 735, pl. 112, figs. 9, 10. [Panama.]
1903. *Thymele rhacoces* Mabille (ms.), Gen. Insect., XVII, p. 28. (As synonym of *polias*.)
1912. *Calliades polias* Mabille & Boullet, Ann. Sci. Nat., Zool., (9), XVI, p. 110. [Central America.]
1912. *Calliades rhacoces* Mabille & Boullet, Ann. Sci. Nat., Zool., (9), XVI, p. 109 and 110.
1922. *Cecropterus zeutus* Draudt, in Seitz Macrolep., V, p. 871, pl. 172 d. (As *zeutes* on plate.)
1922. *Cecropterus polias* Draudt, in Seitz Macrolep., V, p. 868.
1922. *Cecropterus rhococes* Draudt, in Seitz Macrolep., V, p. 868.

Godman has placed *koluthos* Plotz as a synonym of *zeutus* Moschler, Draudt suggests that *rhacoces* Mabille & Boullet is the female of *zeutus* and apparently this is so, and a female specimen in the Bell Collection agrees with the Godman figure of *polias*.

The male of *zeutus* differs from that sex of *phrynicus* Hewitson in lacking the costal fold of the primaries. The discal hyaline band of the primaries is tinged with yellow in the male and is white in the female.

The form of the male genitalia of *zeutus* differs considerably from that of *phrynicus*, the terminal arms of the uncus are shorter and the girdle much longer, the claspers are asymmetrical, cleft at the termination, the ventral flange terminating in a hook-shaped process which carries some small serrations on the outer edge. The aedoeagus widens from the base toward the apex, at which on the dorsal side there is a rounded flange with some small serrations and there is also a cluster of internal spines near the center.

The specimens at hand are from St. Laurent, French Guiana and Iquitos, Peru.

Telemiades megallus Mabille (Pl. I, fig. 12)

1888. *Telemiades megallus* Mabille, Le Naturaliste, (2), II, p. 221, fig. 3. (not fig. 4.) [Rio San Juan.]

1893. *Telemiades megallus* Godman & Salvin, Biol. Centr.-Amer., Rhop., II p. 318, pl. 79, figs. 1, 2.

1922. *Telemiades megallus* Draudt, in Seitz Macrolep., V, p. 869, pl. 169 a.

As noted by Godman & Salvin, the figures 3 and 4 in Mabille's paper are transposed, figure 3 agreeing with the description of *megallus* whereas figure 4 does not.

The figure given by Godman & Salvin shows a bluish-grey anal angle area of the secondaries beneath, that given by Draudt entirely lacks this coloration and it seems quite likely that *megallus* may occur in this form as the specimens before us do not have this bluish-grey area so extensively present as in the Godman & Salvin figure and in one female it is reduced to a very few scattered scales in the abdominal fold.

The uncus is blunt at the apex with two short projections, one at each side and a slender spine-like flange projecting forward from the base on each side. The scaphium is well developed and shagreened at the tips. The claspers are very similar but not quite symmetrical and are rather broad and long, the apex broad, back of which there is a dorsal fissure followed internally by a serrate flange, there are numerous dorsal serrations toward the apex and some lateral teeth and on the inner side toward the base and near the dorsal edge there is a short flange, serrate on the ventral edge. The aedoeagus is long, slender and carries near the center two clusters of internal spines, the basal one long, the other short and some scattered spines at the apex.

Telemiades azines (Hewitson) (Pl. XXIII, fig. 6)

1867. *Eudamus azines* Hewitson, Descr. One Hundred New Spec. Hesp., (1), p. 18. [Amazon.]

1875. *Eudamus azines* Hewitson, Exot. Butt., V, Plate, Eudamus 3, fig. 25.

The uncus is long and slender, with a short, rounded flange on each side at the base. The claspers are short, the termination obliquely upturned in a sharp pointed triangle with a few small serrations at the base on the outer edge, preceding which there is a slight angle in the ventral edge, back of the triangular apex there is a dorsal fissure and the dorsal edge of the clasper is produced forward into a slender projection.

Telemiades (?) **acutipennis** Mabille & Boullet (Pl. I, fig. 1)

1912. *Telemiades acutipennis* Mabille & Boullet, Ann. Sci. Nat., Zool., (9), XVI, p. 120. [Locality not given.]

The single male in the writer's collection agrees with the description of *acutipennis* except that there is a decided purplish tinge to both sides of the wings where they are not covered with the brownish-red overscaling. This purplish tinge is not mentioned in the original description and it may be that this specimen is a closely allied species or merely an individual variation.

Mabille & Boullet state that if it were not for the costal fold on the primaries of the male this insect would fall in the genus *Ablepsis* as there is a hair-tuft lying in the abdominal fold of the secondaries beneath. The hair-tuft in the specimen at hand appears to be less developed than in such specimens of *Ablepsis* as the writers have been able to examine, it emanates from the discal edge of the abdominal fold a little below the base and is rather short and yellowish-brown in color, below it, lying in the abdominal fold, are two longer and heavier, spine-like hairs. As this species does not entirely agree with either *Telemiades* or *Ablepsis* it is left where the authors have placed it.

The uncus terminates in two slender arms, the girdle is slender, the saccus greatly developed. The aedoeagus is rather long, bulbous at the base, and carries several clusters of internal spines and one external cluster at the apex. The claspers are short, the ventral edge at the apex is bent obliquely downward, the apex is broad and slants obliquely inward, with a slight outward projection from the upper part, a dorsal fissure near the apex and immediately back of it a dorsal flange.

Explanation of Plate I

Male Genitalia

Fig. 1.—*Telemiades* (?) *acutipennis* Mabille. Putumayo River region, Peru.

Fig. 2.—*Codatractus cyledis* Dyar. Chilpancingo, Guerrero, Mexico.

Fig. 3.—*Telegonus elorus* Hewitson. Nue Bremen, Sta. Catharina, Brazil.

Fig. 4.—*Calliades zeutus* Moschler. St. Laurent, French Guiana.

Fig. 5.—*Chrysoplectrum bahiana* Herrich-Schaffer. Santa Cruz, Bolivia.

Fig. 6.—*Telemiades azines* Hewitson. Iquitos, Peru.

Fig. 7.—*Calliades phrynicus* Hewitson. Iquitos, Peru.

Fig. 8.—*Goniurus reductus* Riley. St. Laurent, French Guiana.

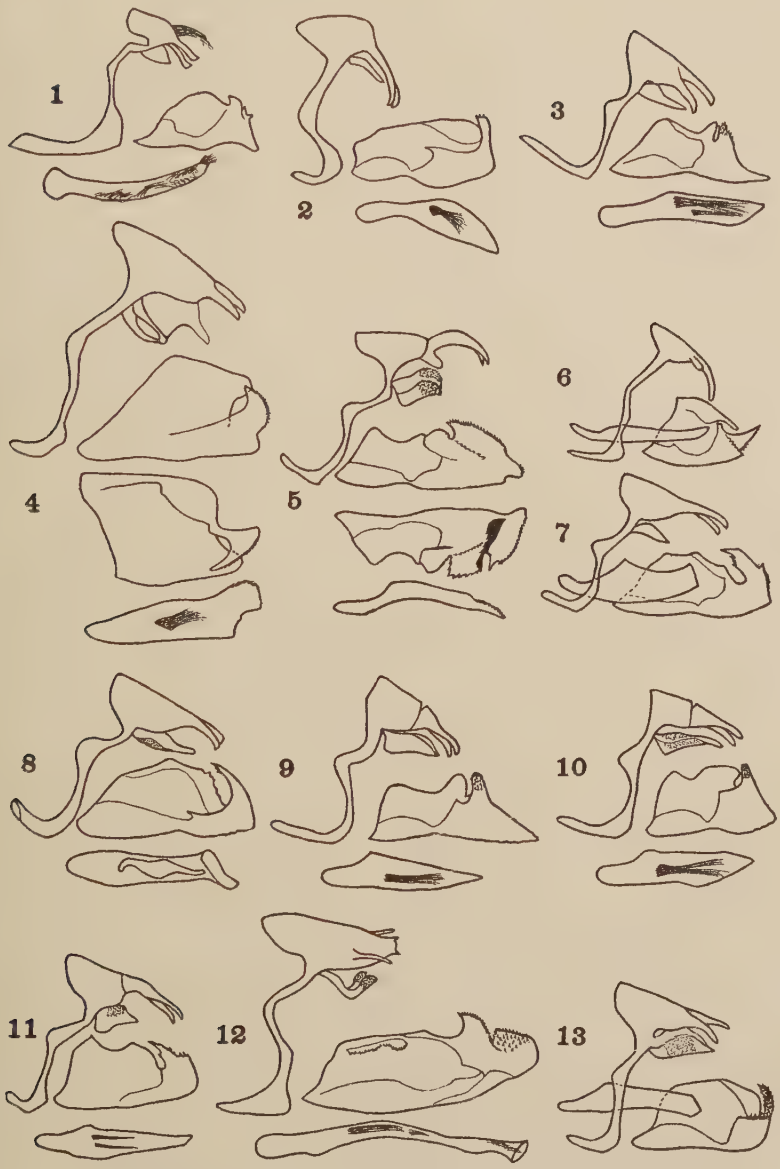
Fig. 9.—*Telegonus hahneli* Staudinger. Cauca, Colombia.

Fig. 10.—*Telegonus cretellus* Herrich-Schaffer. Santiago, Cuba.

Fig. 11.—*Goniurus erycina* Plotz. Massaranduba-Blumenau, Sta. Catharina, Brazil.

Fig. 12.—*Telemiades megallus* Mabille. Iquitos, Peru.

Fig. 13.—*Telegonus tristis* Draudt. La Merced, Chanchamayo, Peru.



WILLIAMS AND BELL—AMERICAN HESPERIOIDEA

STUDIES IN ORTHOPTERA WHICH OCCUR IN NORTH AMERICA NORTH OF THE MEXICAN BOUNDARY

BY MORGAN HEBARD

(Plates II–III, text figure)

The first two sections of this series have recently appeared,[1] dealing with the Genera *Psychomastax* and *Cyphoderris*.

III. REVISIONARY DATA AND NEW NORTH AMERICAN DECTICINAE

In the large series of this interesting group now assembled for study we find eight new species and one new race. Many of the species of the Decticinae are scarce and very local in distribution and all are nocturnal. It is therefore always a most difficult but interesting task in the field to attempt to secure at each locality visited the species which are present. Stalking individuals which are stridulating at night and capturing them with the aid of a flash light after close approach is the most important method of securing many of the forms, but we have secured many valuable specimens by examining possible hiding places in the day time (ranging from Tree Yuccas, Century Plants and Prickly Pear to empty greasy barrels) and by violent beating of clumps of desert plants or brush.

Atlanticus americanus hesperus new subspecies (Text figs. 3 and 4)

In past literature this insect has been recorded only by Rehn and Hebard as *americanus* in 1916, from Lookout Mountain, Tennessee; Bainbridge, Georgia; River Junction, Florida; Opelika, Alabama, and Holly Springs, Winona, Meridian and Natchez, Mississippi. It is the western race of the species and occurs east to Lookout Mountain, Tennessee; Bainbridge, Georgia and Camp Torreya in Liberty County, Florida, and west to Meridian and Natchez, Mississippi, and Alto Pass and Thebes, Illinois.

[1] Trans. Amer. Ent. Soc., LIX, pp. 363 to 375, (1934).

The races of *americanus* may be distinguished particularly by the following features.

A. Size averaging smaller and limbs shorter. Male subgenital plate with a medio-longitudinal cleft between the cerci which is longer than one of the styles and is usually very narrow, very rarely broad enough to be termed narrowly V-emarginate, this cleft always preceded by a fine but decided medio-longitudinal carina for some distance. Male styles averaging shorter. Female subgenital plate narrowly divided medio-longitudinally, the cleft extending decidedly more than half the distance to the base of the plate, the lateral projections thus formed each longer than its basal width. (See text figs. 1 and 2.)
americanus americanus (Saussure)

AA. Size averaging larger and limbs longer. Male subgenital plate with a median emargination between the cerci angulate emarginate, individually sometimes U-shaped or narrowly V-emarginate, this usually not as long as one of the styles and with medio-longitudinal carina before it normally obsolete, rarely very faintly indicated (present only in Ohio material). Male styles averaging longer. Female subgenital plate V-emarginate meso-distad, this cleft extending less than half the distance to the base of the plate, the lateral projections thus formed each slightly shorter than or no longer than its basal width. (See text figs. 3 and 4.).....*americanus hesperus* new subspecies

Type.— ♀ ; River Junction, Florida. August 31, 1915. (Rehn and Hebard; among tree shoots in heavy deciduous forest on limestone hills.) [Hebard Collection, Type No. 1250.]

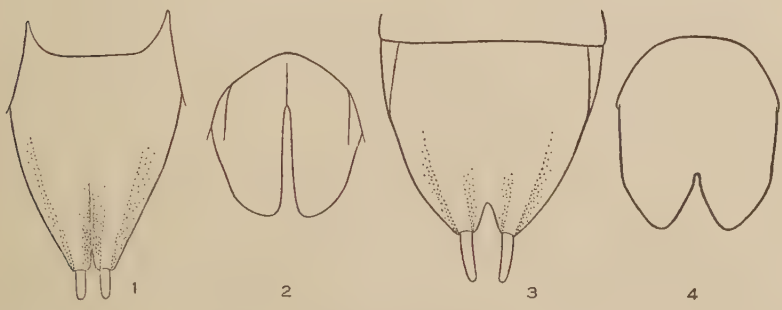
Size large, form graceful, limbs elongate for the genus. Fastigium broader than a proximal antennal joint, rounding broadly with a minute median dorso-distal impression. Pronotum with disk defined from lateral lobes by prominent percurrent carinae, which in dorsal aspect are very broadly and feebly concave in cephalic portion and more strongly convex in the shorter caudal portion. Tegmina absent. Ultimate tergite rather deeply angulate-emarginate mesad, there the small rounded-rectangulate supra-anal plate projects from beneath. Cerci short, acute. Ovipositor elongate, unarmed, almost straight and only very feebly decurved, the dorsal margin at apex strongly declivent to the acute apex which is at the ventral margin. Subgenital plate ample, V-emarginate meso-distad, this emargination reaching considerably less than one-half the distance to the base of the plate, lateral apices each no longer than its basal width, their margins rounded-angulate (varying in series to evenly rounded).

Cephalic margins of cephalic and median and internal margins of caudal femora armed with a few spines. Caudal femora much more than twice length of pronotal disk.

Allotype.—♂; same data as type. [Hebard Collection.]

Size slightly smaller than female and caudal femora shorter. Tegmina projecting beyond pronotum, the exposed portions short, rounded, convex and covered with a network of veins distad. Ultimate tergite bluntly rectangulate produced on each side dorsad, the margin between forming a shallow rounded obtuse-angulate emargination. Below this is the transverse, feebly obtuse-angulate rounded supra-anal plate. Cerci as in *americanus americanus* but definitely more elongate with apices acute. Subgenital plate simple, with prominent rounded lateral carinae convergent to the style sockets, a V-shaped (varying from narrow to U-shaped in series) distal emargination which is shorter than one of the styles. Styles moderately elongate, straight, slender.

Coloration generally mottled wood brown, the sides of pronotum (and rarely of abdomen) shining blackish brown (usually leaving the ventral portions paler), with a narrow buffy margin at the humeral sinus. Occasional individuals are much more generally buffy brown, sometimes conspicuously flecked with dark brown.



(*Figures greatly enlarged*)

Fig. 1.—*Atlanticus americanus americanus* (Saussure). Ventral view of subgenital plate. Male. Reega, New Jersey. Fig. 2.—*Atlanticus americanus americanus* (Saussure). Same. Female. Plummers Island, Maryland. Fig. 3.—*Atlanticus americanus hesperus* new subspecies. Same. Male. *Allotype.* River Junction, Florida. Fig. 4.—*Atlanticus americanus hesperus* new subspecies. Same. Female. *Type.* River Junction, Florida.

The following are the measurements of the type and allotype:[2] length of body ♂ 24, ♀ 24.3; length of pronotum ♂ 9.3, ♀ 10.2; greatest (caudal) width of pronotal disk ♂ 6, ♀ 6; exposed length of tegmen ♂ 2.1, ♀ 0; length of caudal femur ♂ 27.3, ♀ 29; length of ovipositor 27.6 mm.

Four males and three females bear the same data as the type and allotype and are here designated paratypes as well as the series from Liberty County, Florida, listed below.

The variation in the contour of the emargination of the subgenital plate is noted above for both sexes. The extremes for the males occur in the River Junction series, but in none of the material before us is this emargination in that sex as narrow as in typical material of *americanus americanus* nor is it preceded by a medio-longitudinal carina, except in Ohio material. In the females variation is found in the degree of angulation shown in the convexity of the lateral apices.

The female from Lookout Mountain, Tennessee, recorded by Rehn and Hebard in 1916, shows a tendency toward *americanus americanus*. Two males from the series taken near Talladega, Alabama, are typical of *americanus americanus*. The Ohio material is all typical of *americanus hesperus* except that the males have the subgenital plate showing marked carination preceding the comparatively shallow meso-distal emargination.

In the northwestern portion of the species distribution the females, but not the males, of *americanus hesperus* show differentiation which may indicate the presence there of a third geographic race, but which, we believe, is more probably indicative of incipient racial evolution which has not progressed sufficiently to warrant nominal recognition. With only three females from that region before us, the exact significance of the difference shown can not be determined. The three females in question are from Alto Pass, Illinois, and Holly Springs and Winona, Mississippi. All of these have the subgenital plate with emargination deeper than normal in *americanus hesperus*, as deep or slightly deeper than the remaining length of the plate, with

[2] Measurements of specimens from Lookout Mountain, Tennessee; River Junction, Florida; Opelika, Alabama, and Holly Springs, Meridian and Natchez, Mississippi, are given under *americanus* by Rehn and Hebard, *Trans. Amer. Ent. Soc.*, XLII, pp. 76 to 78, (1916).

lateral productions approximately as long as broad but, as usually is the case in *americanus hesperus* but never in *americanus americanus*, triangular, tapering to their rounded apices.

Specimens Examined (in addition to the ten pair previously recorded): 108; 25 males, 61 females and 22 immature individuals.

Ohio. Fairfield County, X, 25, 1931, (J. C. Hambleton), 1 ♀, [Ohio State Mus.]. Camp Neotoma, Hocking County, VII, 4, 1931, (E. S. Thomas), 1 juv. ♀, [Ohio State Mus.]. Harrison Township, Vinton County, IX, 17, 1931, (C. F. Walker), 1 ♀, [Ohio State Mus.]. Byer, Jackson County, IX, 12, 1932, (Walker and Bailey), 3 ♂, [Ohio State Mus.]. Nile Township, Scioto County, IX, 13, 1931, (C. F. Walker), 1 ♂, 1 ♀, [Ohio State Mus.]. Fort Hill, Highland County, VII, 22, 1931, (C. F. Walker), 1 ♂, [Ohio State Mus.].

Tennessee. Nashville, XI, 1932, (J. L. Major), 1 ♂, [U. S. Nat. Mus.], Allardt, 1650 feet, VIII, 11 to X, 10, 1922 and 1924, (T. H. Hubbell), 3 ♂. 7 ♀, 3 juv. ♂, 6 juv. ♀, [Univ. of Michigan].

Georgia. Two miles south of Armuchee, VIII, 26, 1929, (T. H. Hubbell), 1 ♂, 1 ♀, [Univ. of Michigan]. Barnesville, VI, 8, 1925, (T. H. Hubbell), 2 ♂, 1 ♀, 1 large juv. ♂, 1 large juv. ♀, [Univ. of Michigan].

Florida. River Junction, VII, 25, 1925, (T. H. Hubbell), 1 ♂, *paratype*, [Univ. of Michigan]. Camp Torreya, Liberty County, IV, 27 to VI, 2, 1924, 5 juv. ♂, 5 juv. ♀; VII, 25 to VIII, 1, 1929, (T. H. Hubbell), 9 ♂, 22 ♀, *paratypes*, [Univ. of Michigan].

Alabama. Four to nine miles southeast of Talladega, VIII, 24, 1929, (T. H. Hubbell), 10 ♀, [Univ. of Michigan]. Sharpshin Ridge, two miles northeast of Leesburg, VIII, 25, 1929, (T. H. Hubbell), 1 ♂, 14 ♀, [Univ. of Michigan]. Two miles east of Spratt, VIII, 22, 1929, (T. H. Hubbell), 1 ♀, [Univ. of Michigan].

Mississippi. Holly Springs, VII, 12, 1890, (E. H. Raidle), 1 ♀,[3] [U. S. Nat. Mus.]. Bullards, VIII, 20, 1929, (T. H. Hubbell), 1 ♂, [Univ. of Michigan].

Illinois. Alto Pass, VIII, 16, 1909, 1 ♀, [Illinois State Lab.]. Thebes, VII, 31, 1905, 1 ♂, [Illinois State Lab.].

Pediodectes tinkhami new species (Pl. II, fig. 1; pl. III, figs. 1 and 2.)

This insect in size, form (particularly of the pronotal lateral lobes) and projection of the male tegmina beyond the pronotum agrees best with *Eremopedes scudderi* Cockerell, but the strongly bispinose prosternum, more inflated head with larger vertex and the genitalia show that it is a member of the genus *Pediodectes*. The genitalia show nearest approach to the type developed in *P. prattei* (Caudell). The length of the caudal femora in ratio to that of the pronotum also agrees best with that species, due to

[3] This specimen was recorded as *dorsalis* by Caudell in 1907 and measured and recorded as *americanus* by Rehn and Hebard in 1916.

the shorter pronotum, though the caudal femora are distinctly shorter and more robust in proportion to the body than in any previously described species of *Pediodectes*.

The Lower Californian *P. ateloploides* (Caudell) shows features of agreement but, though known only from a female, may be easily distinguished by the decidedly narrower vertex and interocular space, shallower pronotal lateral lobes and very different coloration.

The finely impressed but complete first transverse sulcus of the pronotum, on the other hand agrees best with that of *Ateloplus schwarzi* Caudell. The coloration in general is very different, but in some respects also suggests that species. The head, however, shows a most strikingly distinctive coloration and pattern, as it is black above and below a very broad transverse arcuate cream colored facial band; this only to some extent approached in some individuals of *P. bruneri* (Caudell).

In spite of evident divergence in certain characters toward both *Eremopedes* and *Ateloplus*, *tinkhami* is clearly best placed in *Pediodectes*.

Type.—♂; Chinati Mountains, Presidio County, Texas. October 29, 1928. (E. R. Tinkham.) [Hebard Collection, Type No. 1169.]

Size though large for the Decticinae small for the genus *Pediodectes*, form robust. Head much as in *bruneri* except in being considerably broader, the broad transverse whitish facial band (indicated only in dark specimens of *bruneri*) much more definite and less declivent laterad than it is, when present, in *bruneri*. Fastigium much broader than first antennal joint. Pronotum ample, produced in caudal portion; disk with caudal margin truncate, showing a mere trace of convexity, first transverse sulcus decided, median transverse sulcus decided only on lateral lobes; lateral lobes shallower than normal in *Pediodectes*, humeral sinus broad and shallow (subobsolete in some paratypes). Tegmina projecting beyond pronotum briefly, all but caudal portion of stridulating area covered by pronotal disk; deflexed lateral and caudal portions with a coarse network of veins, costal and distal margins very feebly convex, disto-external angle and sutural margins broadly convex. Prosternum armed with a pair of stout, straight, conical spines much as in *bruneri*. Ultimate tergite produced mesad in two small triangular projections, each no longer than its basal width and separated by a truncate U-shaped area. Cerci much as in *bruneri* but heavier and blunter,

cylindrical, nearly straight, the small rounded apex situated disto-externally and directed disto-externally, a large tapering finger internally at base of apex which terminates in a small spine curved cephalad. Titillators (from paratype) represented by a pair of adjacent spatulate very slender elongate processes which diverge slightly distad, inner margin unarmed and curving distad to outer margin, the latter armed with five heavy teeth curved proximad. Subgenital plate with two heavy rounded carinae which weakly converge distad to the sockets of the small styles, the latter simple, straight, separated by a distance distinctly longer than the length of one of them, the caudal margin of the subgenital plate in the interval between with a small angulate emargination, the margins of which are moderately convex (in *bruneri* this emargination is variable, U-emarginate or shallowly to deeply angulate emarginate). Femora with genicular lobes unarmed except the internal of the median femora which bear a small spine and the internal of the cephalic femora which bear a very small ventral spine. Ventral femoral margins armed with spines (in the series) as follows: cephalic internal 2 to 4, cephalic external 0; median internal 0, median external 0 to 2; caudal internal 4 to 9, caudal external 3 to 9. Cephalic tibiae with dorso-caudal margin armed with a proximal, median and apical spine (and sometimes with one additional spine), caudal margin (rarely) with a proximal and median spine.

Allotype: ♀ ; same data as type but taken at 6400 feet, July 17, 1930. [Hebard Collection.]

Generally similar to male in ambisexual features, larger. Tegmina represented by small vestigial lateral pads concealed by the pronotum. Pronotum less produced caudad with caudal margin of disk truncate. Ultimate tergite medio-longitudinally deeply sulcate and with caudal margin produced in two minute rounded projections above each side of the very small rounded triangular supra-anal plate. Ovipositor elongate but considerably shorter than the robust (and comparatively short for the genus) caudal femur, weakly curved dorsad, base stout, apex very sharply acute, margins unarmed, dorsal and ventral valves both with a medio-longitudinal carina only near the immediate apex. Subgenital plate with lateral margins almost parallel, disto-lateral angles rounded, distal margin broadly concave.

Generally cinnamon buff mottled with clay color (and with microscopic short streaks of tawny olive), paling to light ochraceous buff broadly along cephalic and ventral margins of pronotal lateral lobes and exposed margins of male tegmina. Cephalic femora, all tibiae (but particularly the caudal) and subgenital plate in two adult males tinged with green, this often very weak

or absent. Exposed portion of the stridulating areas of the male tegmina brown. Antennae immaculate, light brown. Head with a broad transverse band of bright cream color which laterad curves moderately ventrad, portions of face above clypeus below this marking, genae, extremely narrow area below eyes and ocelli, ventral portion of fastigium and all of facial fastigium shining blackish brown. Palpi buffy. Mouthparts russet.

A darker paratypic male has the pronotal lateral lobes heavily suffused with brown meso-distad and in a small caudal apical area, while the abdomen is strongly tessellate with brown.

Immatures have broad subapical annuli of dark brown on all the femora. Such markins are absent or almost obsolete in the adults.

♂	Length of body	Length of pronotum	Caudal width of pronotum	Greatest exposed length of tegmen	Length of caudal femur	Width of caudal femur
Type	25	8.3	5.7	2.4	21.6	4.9
Paratype	25.6	9.2	6.2	2	23	5.2
♀				Length of ovipositor		
Allotype	32	8.7	5.8	18	23	5.8
Paratype	28.2	8.7	6.2	18	23.8	5.8
Paratype	28.6	8.9	5.6	16.1	24.5	5.7

From the form of the caudal femora we believe that the saltatorial powers of this insect are probably remarkable. The species is probably confined to a very limited area in the United States, but should be found over a much greater extent of territory in adjacent Mexico.

Specimens Examined: 14; 6 males, 6 females and 2 immature individuals. Hills west of the Ord Mountains, Big Bend of the Rio Grande, Texas, V to VIII, 1926, (O. C. Poling), 4 ♂, 3 ♀. Chinati Mountains, Big Bend of the Rio Grande, Texas, (all E. R. Tinkham), 4400 feet, VII, 17, 1930, 1 ♂, 1 ♀, *paratype* and *allotype*, 1 large juv. ♂, 1 medium juv. ♀; IX, 8, 1929, 2 ♀, *paratypes;* X, 29, 1928, 1 ♂, *type.*

Tinkham collected his specimens near Shafter on slopes covered with Sotol, much Lecheguilla, a few Octotillo, Acacias and scattered clumps of grasses and desert plants. In places *Yucca macrocarpa* was fairly common.

Eremopedes covilleae new species (Pl. II, fig. 2; pl. III, fig. 3.)

This is a very handsome insect, apparently largely green in life with buff pronotal margins and male tegmina strikingly black with whitish veins. We believe that it will be found to be peculiar to the Creosote Bush, *Covillea tridentata*, and like *Pediodectes tinkhami* here described is probably distributed over a very limited area in the United States but much more extensively in adjacent Mexico.

Its nearest known relative is *E. scudderi* Cockerell, that insect differing in being larger, more robust, the pronotum with a very weak but appreciable humeral sinus and lacking a meso-caudal marking, the male cerci weakly but distinctly sigmoid and individually showing as a rule a striking striped and maculate color pattern.

Type.—♂; twenty miles North of Chisos Mountains, Big Bend of the Rio Grande, Texas. Elevation 3800 feet. July, 18, 1930. (E. R. Tinkham; on *Covillea tridentata.*) [Hebard Collection, Type No. 1238.]

Size little larger than the average for *E. balli* Caudell which is the smallest species of the genus. Form robust, though not as robust as in *scudderi*. Head similar, but vertex decidedly smaller with width less than that of proximal antennal joint. Pronotum much as in *scudderi* but shorter, disk rounding evenly into lateral lobes with no trace of angulation or carina, caudal portion little produced with caudal margin transverse; first sulcus very fine, caudal sulcus obsolete; lateral lobes shallow, Ateloploid though not as shallow as in that genus, caudal margin of lateral lobes broadly convex ascendant with no trace of humeral sinus but an extensive low convex callosity adjacent to it, sulci all very feebly indicated. Tegmina projecting briefly beyond pronotum, all but caudal portion of stridulating area concealed by disk (entirely concealed in paratype); deflexed exposed distal portion with a coarse network of veins, its margins convex. Prosternum unarmed, but with indication of faint elevations where spines, if present, would be situated. Ultimate tergite as in *scudderi;* produced mesad in two slender triangular processes separated by narrow deep medio-longitudinal emargination which reaches nearly to the base of the tergite. Cerci as in *scudderi* but much straighter; cerci cylindrical and very faintly curved to a submedian point where a large node projects inward, armed at its apex with a minute tooth, apical portion gradually tapering thence to its blunt apex and occupying half the total cercal length. Titillators much as here described for *Pediodectes tink-*

hami, their teeth somewhat less heavy. Subgenital plate with a medio-longitudinal and two coarse rounded lateral carinae which converge weakly distad to the sockets of the small, simple, straight styles, the latter separated by a distance less than twice the length of one of them, the caudal margin in this interval rectangulate emarginate with margins straight. Femora with all genicular lobes armed with a minute spine except the cephalic external. Ventral femoral margins armed (in the series) as follows: cephalic and median unarmed, caudal internal 0 to 8, caudal external 1 to 7. Cephalic tibiae with dorso-caudal margin alone armed with a proximal, median and apical spine.

Coloration apparently light green in life, now faded to light brown except on extremities. Pronotum with ventral margins of lateral lobes broadly (particularly caudad, there including the entire convex callosity) and caudal margin narrowly warm buff, a very small but distinctive pair of short, longitudinal brown suffusions meso-caudad on disk, a fleck of the same mesad at the cephalic margin in the male paratype. Tegmina strikingly black with coarse network of veins warm buff. Antennae, except proximal joints, mars brown in type, buckthorn brown with intersections of joints dark in paratypic and immature male, apparently green in life in immature female.

Though simply colored this is one of the handsomest Decticids of the southwestern United States.

The measurements of a paratypic male follow those of the male type. Length of body 17.5 and 18.3, length of pronotum 5.8 and 6.3, caudal width of pronotum 4.8 and 4.7, greatest exposed length of tegmen 2.1 and 1.6, length of caudal femur 18.3 and and 18.3, greatest width of caudal femur 3.5 and 3.6 mm.

A male paratype, an immature male and an immature female have been studied in addition to the type. These specimens all bear the same data.

Ateloplus hesperus new species

This diminutive species is closely related to *A. luteus* Caudell, a species occurring over a considerable area to the East.[4] The specialization of the ventral surface of the female abdomen is identical, a condition not found in *A. notatus* Scudder of southern California.[5] The male cerci are also nearer those of *luteus*,

[4] As shown by a large series now before us.

[5] A series of *notatus* from southwestern San Diego County, California, is now before us.

though the production of the apex is decidedly less pronounced and of different form. The male styles agree with those of *notatus*, being considerably larger and longer than in *luteus*. The male ultimate tergite in *hesperus* and *luteus* has its two projections much more produced than in *notatus*, this being slightly greatest in *hesperus;* but these projections are less produced and less acute in *hesperus* than in a topotypic male of *A. minor* Caudell from Oracle, Arizona, in the author's collection. The male subgenital plate in *hesperus* has its distal margin subrectangulate emarginate, thus showing greater emargination than in any of the related species.

Type.—♂; nine miles west of Lone Pine, Owens Valley, California. August 5, 1931. (E. R. Tinkham.) [Hebard Collection, Type No. 1241.]

Size very small, nearly as small as the smallest specimen of *luteus* before us; form robust. Head rounded; fastigium not sulcate, slightly narrower than proximal antennal joint (in *luteus* varying from this to slightly wider than the proximal antennal joint). Pronotum broad, short, transversely evenly convex with lateral lobes shallow and strongly deflexed; first transverse sulcus fine but decided, median sulcus subobsolete; disk with cephalic and caudal margins truncate; lateral lobes with a broad but well defined humeral sinus present; convex callosity indistinct. Tegmina briefly projecting beyond pronotum with entire stridulating area concealed (in *luteus* varying from this to having the distal portion of the stridulating area exposed), the deflexed exposed distal portion with a network of veinlets, its margins convex. Prosternum unarmed. Ultimate tergite with a blunt acute-angulate projection which is longer than its basal width present mesad on each side of the median line, (such projections in *luteus* vary from as long as to decidedly shorter than their basal width). Cerci very small, a stout and very slightly tapering shaft with apex oblique to its moderately produced (much less so than in *luteus*) internal angle, which production gradually narrows to the minute terminal tooth. Subgenital plate with a weak medio-longitudinal carina and strong slightly convergent lateral carinae, distal margin rounded sub-rectangulate emarginate. Styles moderately large, cylindrical, three times as long as broad, separated by a distance equal to the length of one of them. Genicular lobes of femora unarmed except one of the median internal which bears a single minute spine (see variation in females). Ventral femoral margins armed with very small spines (in the series as follows; cephalic internal 1 to 2, cephalic external 0;

median internal 0, median external 1 to 3; caudal internal 3 to 5; caudal external 3 to 7). Cephalic tibiae with external margin of dorsal surface armed with a proximal, median and distal spine.

Allotype.— ♀ ; same data as type. [Hebard Collection.]

Very similar to this sex of *luteus* except that in the dark color phase the pale margins of the paler medio-longitudinal pronotal area are more suddenly constricted mesad (as in the type of *hesperus*). Fastigium damaged (in female paratype very slightly narrower than first antennal joint). Pronotum shorter but otherwise similar to that of male. Tegmina represented by minute rounded lateral pads not projecting caudad of the caudal margin of the pronotum. Ultimate tergite with a somewhat deflexed acute-angulate projection longer than wide on each side of a median impression, these projections smaller but of the same type as in the male and more produced and slender than in females of *luteus*. Ovipositor of moderate length, distad weakly recurved to the acute apex; there with lateral surfaces rugulose, the dorsal valves with a medio-longitudinal carina on sides, the ventral valves with a shorter longitudinal carina dorsad on sides; generally much as in *luteus* (in which species the ovipositor varies individually from elongate to comparatively short). Subgenital plate as in *luteus;* with two elevated lateral carinae produced distad to form rounded quadrate lobes, their inner margins forming a quadrate median emargination; surface of plate between the lateral carinae formina a deep broad longitudinal channel, lateral portions with surfaces concave. Preceding sternite as in *luteus;* with a slightly longitudinal, blunt conical projection mesoproximad. Sternite before that, as in *luteus*, with a large, very bluntly rounded median elevation. These two sternites are unspecialized in the other species of the genus except *schwarzi* Caudell, in which the sternite preceding the subgenital plate is alone specialized.

General coloration brown, maculate with blackish and grayish. Head, a broad medio-longitudinal area on occiput and pronotum, lower portion of pronotal lateral lobes and limbs paler. The broad medio-longitudinal band on pronotum shows decided constriction just caudad of the principal sulcus; it is margined with black, and has dark medio-longitudinal lines which are continued on the abdomen. Face and limbs finely strigate with blackish, a more definite fleck of this dorso-externally at end of inflated portion of caudal femora. These markings are much as in this color phase of *luteus*, except for the more pronounced constriction of the dorsal band. As both *luteus* and *notatus* develop also a distinc-

tive buff color phase with a medio-longitudinal black stripe the most conspicuous marking, we believe that that phase will also be found to occur in *hesperus*.

The measurements of a female paratype, taken near Little Lake, Owens Valley, California, August 6, 1931, by E. R. Tinkham, follow those of the allotype. Length of body ♂ 13.8, ♀ 16.8 and 17.3; length of pronotum ♂ 4.7, ♀ 4.8 and 5.1; caudal width of pronotum ♂ 3.2, ♀ 3.9 and 3.8; exposed length of tegmen ♂ 1.1; length of caudal femur ♂ 11.6, ♀ 13.2 and 15.1; width of caudal femur ♂ 2.6, ♀ 3 and 3.3; length of ovipositor 12 and 14 mm.

Ateloplus splendidus new species (Pl. II, fig. 3; pl. III, fig. 4.)

This is the largest and handsomest known species of the genus, exceeding *A. schwarzi* Caudell in size and distinctively marked with mars brown, ochraceous buff and light buff. Not only larger but also more robust than *schwarzi*, the greatest differences are shown by the male genitalia, in which closest general agreement is shown to the much smaller and very differently marked *A. notatus* Scudder, (see pl. III, fig. 5).

Type.—♂; Barstow, Mojave Desert, California. August 10, 1931. (E. R. Tinkham.) [Hebard Collection, Type No. 1239.]

Size very large and form very robust for the genus. Head full and rounded, the fastigium with dorsal surface moderately concave disto-dorsad, its width distinctly less than that of the first antennal joint. Pronotum very broad, short, evenly convex with lateral lobes shallow and even less deflexed than in the other species of *Ateloplus;* first transverse sulcus fine but decided, median sulcus similar but becoming very weak dorsolaterad; disk with cephalic margin truncate, caudal margin truncate with a trace of broad concavity mesad; lateral lobes with margin rounding broadly caudad with a short and very shallow humeral sinus indicated (obsolete in one paratypic male), convex callosity very extensive but very little raised. Tegmina projecting briefly beyond pronotum, all but caudal portion of stridulating area concealed by disk, deflexed exposed distal portion with a coarse network of veins, its margins convex. Prosternum unarmed. Ultimate tergite as in *luteus;* a small rounded projection (more acute in paratypes) present mesad on caudal margin on each side of a small meso-distal impression. Cerci very small, a cylindrical shaft which tapers very slightly with apex bluntly conical, its inner margin oblique to a small slightly curved tooth which is

directed meso-cephalad.[6] Titillatores of same general type as in *Pediodectes tinkhami* here described, but more divergent, slenderer and armed on outer margin with more numerous small teeth. Subgenital plate as in *notatus* except that the distal emargination is deeper; a very fine medio-longitudinal carina indicated only proximad, but very heavy rounded lateral carinae weakly convergent distad to the sockets of the very small, simple, cylindrical styles, these separated by a space over twice the length of one of them, this interval concave and almost as deep as broad (rounded rectangulate emarginate in one paratype, slightly broader rounded angulate emarginate in the other). Femora with all but external cephalic genicular lobes armed with one or two minute spines (external caudal also unarmed in allotype). Ventral femoral margins armed with spines (in the series) as follows; cephalic internal 2 to 5, cephalic external 0 to 1, median internal 0 to 1, median external 2 to 5, caudal internal 2 to 5, caudal external 3 to 7. Cephalic tibiae with dorsal surface armed with a single disto-external spine.

Allotype.— ♀ ; near Coyote Wells, Imperial Valley, California. June 11, 1915. (H. Morrison.) [Hebard Cln.].

Generally similar to male in ambisexual characters, size much larger. Fastigial impression subobsolete. Pronotum even shorter with caudal margin of disk very broadly concave, humeral sinus very shallow but moderately extensive. Tegmina concealed by pronotun, represented by minute circular pads covered by a coarse network of veins. Ultimate tergite with a small meso-distal impressed area flanked by small blunt obtuse-angulate projections. Supra-anal plate triangular with apex convex, slightly wider than long. Ovipositor moderately elongate, almost as long as the comparatively short caudal femur, almost straight but showing very feeble curvature dorsad, base stout; apex with sides rugulose, dorsal valves there showing a subobsolete medio-longitudinal carina and ventral valves with a sharp carina slightly dorsad of a medio-longitudinal line. Subgenital plate moderately large, a medio-longitudinal carina indicated proximad, the apex irregularly rectangulate emarginate. Caudal femora distinctly shorter and stouter than in male.[7]

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[6] This is much as figured by Caudell for the male he described as *notatus* from Bill Williams Fork, Arizona, (*Proc. U. S. Nat. Mus.*, XXXII, p. 370, fig. 55). That specimen actually represents a distinct species nearer *splendidus*. Males before us of *notatus* from Jacumba, California, are found to have the cerci of similar type but with apical tooth differently placed (see pl. III, fig. 5).

[7] The less impressed vertex and shorter heavier caudal femora do not appear to have much significance, even sexual, when we consider the large amount of individual variation shown by most species of the Decticinae of which large series are before us.

Head, pronotum and limbs light ochraceous buff heavily washed and maculate with bister as figured. The most conspicuous markings are a medio-longitudinal pair of very fine lines on head and pronotum (this intermittent on pronotum in allotype), continued on the abdomen as paired flecks on each tergite; a postocular pair of very fine lines on head; a broad dorso-lateral longitudinal suffusion on pronotum; subapical suffusions on cephalic and median femora, and a general microscopically tessellate suffusion over dorsal surface of caudal femora. Pronotum with ventral portions of lateral lobes cream color, this including more than half their area in males but decidedly less extensive in female. Tegmina bister, with veins, veinlets and in male the marginal field, cream color. Ovipositor ochraceous tawny with apex chestnut brown.

The measurements of the type precede those of one of the two male paratypes which bear the same data. Length of body ♂ 27.5 and 24.8, ♀ 28; length of pronotum ♂ 8.9 and 8.8, ♀ 8.2; caudal width of pronotum ♂ 7.2 and 6.7,[8] ♀ 6.8; exposed length of tegmen ♂ 3.3 and 3.8; length of caudal femur ♂21.2 and 19.4, ♀ 17.8; greatest width of caudal femur ♂ 3.9 and 3.8, ♀ 4.9; length of ovipositor 17.2 mm.

IDIOSTATUS Pictet 1888.

After detailed study of the ten valid species involved we find that Rehn and Hebard[9] were incorrect in believing that more than one recognizable genus was represented and, therefore, we now concur with Caudell who in 1907 placed *Cacopteris* Scudder 1894 as a synonym.

Caudell's treatment of *Idiostatus* improperly included *Cacopteris sinuata* Scudder 1899, a synonym of *Eremopedes bilineatus* (Thomas), and also *bilineatus*, a species referable to *Eremopedes* as conclusively shown by the present investigation.

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[8] This dimension can not always be given definitely as in life. Sometimes, as in the present specimen, the pronotum has been somewhat compressed laterally in drying, while at other times it may be somewhat flattened out.

[9] 1920. Trans. Amer. Ent. Soc., XLVI, p. 251, footnote 17. Moreover, though *californicus* Pictet (a synonym of *hermanii* Thomas) is the genotype of *Idiostatus*, *aequalis* Scudder is the genotype of *Cacopteris* by original designation, and so *inermis* Scudder was improperly designated genotype of *Cacopteris* by Kirby in 1906.

The species of *Idiostatus* show the following characters. Size very large in *hermanii* (Thomas) and *elegans* Caudell, large in *variegatus* (Scudder), *rehni* Caudell and *magnificus* here described, considerably smaller in the other species. Cephalic tibiae with internal margin of dorsal surface armed with two spines in *nevadensis* (Scudder) and *aequalis* (Scudder), armed with one or two spines or unarmed in *hermanii*, unarmed in the others. Male tegmina with a striking spot in the outer apical angles in *nevadensis* and *aequalis*, immaculate there in the other species. Caudal femora with a striking proximal and median dark marking in *callimerus* Rehn and Hebard, there less conspicuously marked in *variegatus*, *magnificus*, *elegans* and *inermis*, (Scudder) more generally mottled or immaculate in the other species. Male ultimate tergite without a conspicuous meso-distal area of soft integument in *nevadensis*, *aequalis*, *callimerus* and *inyo* Rehn and Hebard, such an area conspicuously developed in the other species. Male cerci with a submedian external shoulder, these curving gradually inward to the acute apex in *nevadensis* and *aequalis;* with a distal and medio-internal tooth curved sharply inward (Anabroid) in *inermis;* with an internal tooth in the other species (the form of the cercus and development and position of the tooth different in each). In all species of which the females are known the distal margins of the ovipositor are very minutely but definitely denticulate, this distinguishing them from all other known species of the North American Decticinae. Ovipositor slightly decurved in *rehni* and *hermanii;* straight or slightly recurved in the other species. Apex of male abdomen strikingly marked with shining black in *magnificus*, *elegans* and *inermis*, such marking narrowly and less conspicuously shown in *variegatus* and absent in the other species.

Though subdivision into several genera appears to be unwarranted, the differentiation between many of the species of *Idiostatus* is very great indeed.

Idiostatus magnificus new species (Pl. II, fig. 4; pl. III, fig. 6.)

This beautiful insect is closely related to *I. elegans* Caudell, differing in the smaller (though large) size, shorter limbs, very differently shaped male cerci (with shaft much more slender and inner tooth apical in position) and occiput, pronotum and abdomen more extensively darkened but markings of the caudal

femora less extensive (though considerable variation in the extent of such markings will probably be found to occur in each of these species).

Type.—♂; Cedar Peak, Warner Mountains, Modoc County, California. Elevation 8200 feet. August 25, 1922. (J. A. G. Rehn; scrambling about on bare rock fragments with a very few low Hudsonian Zone plants at base of lava pinnacle near summit.) [Hebard Collection, Type No. 1240.]

Size large for the genus, form very robust. Head broad, full, rounded; the fastigium with merest trace of medio-longitudinal sulcation, one and one-third times as wide as proximal antennal joint. Pronotum smooth; disk rounding evenly into the lateral lobes except in the produced caudal portion where distinct though broadly rounded shoulders occur; caudal production brief with caudal margin truncate, very feebly convex; lateral lobes considerably longer than deep, much as in *I. inyo* Rehn and Hebard, shallower than in *I. hermanii* (Thomas) or in Caudell's figure of *elegans*, humeral sinus extremely broad and shallow, subobsolete as in *inyo*, convex callosity obsolete. Tegmina extending beyond pronotum about two-thirds pronotal length, exposed portion reaching almost to stridulating vein, median area meso-caudad in stridulating field rounded quadrate, as broad as long and without veinlets. Prosternum unarmed. Penultimate tergite with soft integument in median section. Ultimate tergite transverse, with a large meso-distal section composed of soft integument and hirsute, the caudal margin rounding into a quadrate median emargination. Cerci stout, shaft slightly narrowest mesad, evenly moderately incurved; distal portion swollen, with a small acute apex and a sharp larger inner spine directed at a right-angle to the shaft and slightly incurved. Subgenital plate broad and ample without a median carina but with sharply rounded lateral carinae weakly convex-convergent to the small style sockets, between which the distal margin is rounded rectangulate emarginate. Styles very small, simple, slightly over twice as long as broad, separated by a distance over four times the length of one of them. Limbs short. Genicular lobes with cephalic of cephalic and median with two minute spines and caudal of median with one minute spine, the others unarmed. Ventral femoral margins armed with very minute spines as follows; cephalic internal 1 and 2, cephalic external 0, median internal 1 and 1, median external 0 and 3, caudal interna 15 and 6, caudal external 4 and 5. Cephalic tibiae with dorsal surface armed on outer margin only with a proximal, median and distal spine.

Generally pinkish buff becoming cinnamon buff dorsad. Postocular area and occiput to base of fastigium blackish brown.

Pronotum with large median section of lateral lobes blackish brown, this crossing the disk caudad before the caudal margin and invading the very faintly indicated transverse and medio-longitudinal sutures. Tegmina dorsad bister, laterad cinnamon, with veins conspicuously warm buff. Abdomen with first exposed tergite largely black, succeeding tergites each with several symmetrically arranged black spots which spots are less and less extensive caudad; last three tergites shining black, the first of these with brief proximal areas of cinnamon buff, the penultimate tergite with large soft area and the cerci cinnamon buff. Limbs and ventral surface pinkish buff; femora with blackish flecks, caudal femora with a large black suffusion dorso-proximad, a meso-dorsal fleck of black, an internal pre-genicular blackish streak and apices blackish brown. Tibiae with spines black and flecks of the same at their bases.

Length of body 24.2, length of pronotum 7.2, caudal width of pronotum 5.7, exposed length of tegmen 4.4, length of caudal femur 16, greatest width of caudal femur 3.8 mm.

IDIONOTUS Scudder 1900

This genus and the species *brunneus* Scudder were based on a single female from Folsom, California. The material now before us shows that five species occur in California. The first, known only from males, is found at Thrall in northern central Siskiyou County (these males were described as that sex of *brunneus* by Caudell in 1907). The second is known only from females from the lower portions of central California and we believe represents *brunneus*. The third, of which we have both sexes, is found in the Sierras in Mariposa and Tuolumne Counties. A fourth is represented only by an immature male from the Sierras in Fresno County and probably a female from Tulare County. The fifth we have in large series from the Tehachapi Mountains.

The males show extraordinary genitalic specialization, but the females are separable only by much less striking features of difference.

Idionotus siskiyou new species (Pl. III, fig. 7)

1907. *Idionotus brunneus* Caudell (males not of Scudder, 1900), Proc. U. S. Nat. Mus., xxxii, p. 395, fig. 80. [♂; Thrall, California.]

Before it was known that a number of species of this genus occurred in California, it was perfectly logical for Caudell to have supposed that the males here treated represented the yet unknown

male of *brunneus*. We believe that males of that species will, however, show very different genitalic development.

In *siskiyou* the male is smaller and more robust than that sex of *I. tehachapi* here described, with development and organs of flight very similar but with ultimate tergite, cerci, titillators and subgenital plate very different.

Type.—♂; Thrall, Siskiyou County, California. July, 28, 1906. (A. N. Caudell.) [Hebard Collection, Type No. 1242.]

Size medium for the genus, form moderately robust. Head deep, width across cheeks proportionately distinctly less than in *tehachapi;* fastigium large, not sulcate, nearly twice width of proximal antennal joint; face microscopically shallowly and moderately impresso-punctulate. Pronotum short, disk flattened convex with lateral carinae percurrent, divergent cephalad from second lateral sulcus and divergent more strongly caudad from that point than in *tehachapi*, sulci very weak, caudal margin truncate; lateral lobes strongly declivent, deep, not as elongate as in *tehachapi*, humeral sinus broad and weak, convex callosity obsolete. Tegmina exposed as far as portions of stridulating vein, rounded, covered by a network of veinlets. Prosternum unarmed. Ultimate tergite produced mesad, with lateral margins broadly convex to a very small rounded median emargination which is preceded by a short fine medio-longitudinal sulcus. Cerci short, with a minute acute apex, internal portion very broadly lamellate with margin convex to a stout proximal tooth directed inward with apex curved cephalad. Titillators (in this specimen) with two adjacent short bluntly pointed apices projecting caudad briefly from an extensive mantle. Subgenital plate very ample, distad with a very fine medio-longitudinal and short broadly rounded lateral carinae, the latter terminating in the style sockets, distal margin rounded rectangulate emarginate. Styles simple, tapering, over three times as long as broad, separated by an interval distinctly greater than the length of one of them. Genicular lobes with the external unarmed, the internal each with a single minute spine except on one of the cephalic femora. Ventral femoral margins armed with minute spines as follows; cephalic internal 2 and 2, caudal external 2 and 0, others unarmed. Cephalic tibiae with dorsal surface armed on outer margin with a proximal, median and distal spine.

General coloration very dull cinnamon buff with numerous microscopic and inconspicuous flecks of dark brown on all but dorsum of head, lateral lobes of pronotum and limbs. Tegmina with very fine and weak mottling laterad. Abdominal tergites with a well spaced series of minute inconspicuous brown flecks

along their caudal margins. Caudal femora with disto-ventral section of enlarged portion extensively weakly darkened (a feature of color pattern apparently appearing in all the species of *Idionotus*).

The measurements of one of two paratypic males in the United States National Museum, which bear the same data as the type, of which Caudell figured the cercus in 1907, follow those of the type. Length of body 16.2 (abdomen retracted) and 20 (abdomen extruded), length of pronotum 6 and 6.2, caudal width of pronotal disk 4.3 and 3.9, exposed length of tegmen 3.6 and 2.3, length of caudal femur 20.5 and 20.6, width of caudal femur 4 and 4 mm.

Caudell discussed this insect at some length, stating that the three males secured were found stridulating in clumps of small oaks. Their song was described as a high pitched trill, the notes one hundred and fifty a minute.

Idionotus tuolumne new species (Pl. III, figs. 8 and 12)

The male of this species is smaller and more graceful than that of *I. siskiyou* here described, but has the cheeks slightly fuller, pronotal disk narrower, tegmina less extensively exposed and very strikingly different genitalia. In form and pronotal discal outline only it agrees more nearly with *I. tehachapi* here described.

The female closely resembles that sex of *I. brunneus* Scudder (see pl. III, fig. 11) differing mainly in the distinctly weaker mesocephalic constriction of the pronotal disk.

Type.—♂; El Portal, Mariposa County, California. Elevation 2000 feet. September 25, 1919. (M. Hebard.) [Hebard Collection, Type No. 1243.]

Size small, form graceful for the genus. Head much as here described for *siskiyou*, but proportionate width across cheeks intermediate between that dimension as found in *siskiyou* and *tehachapi*. Pronotum as described for *siskiyou* but disk proportionately narrower, the lateral carinae less strongly divergent caudad and the humeral sinus even weaker. Tegmina with less area exposed than in *siskiyou* or *tehachapi;* caudal portion of stridulating area visible, covered with a network of veinlets. Ultimate tergite as in *siskiyou* but with median emargination much broader, transverse, with no medio-longitudinal sulcation preceding it. Cerci moderately elongate, directed outward and evenly and quite strongly incurving and tapering to their acute apices, without lateral tooth or lamella. Titillators formed

by a pair of straight, exceedingly slender, adjacent aciculate processes. Subgenital plate less ample than in *siskiyou*, no medio-longitudinal carina present but with weak coarse rounded meso-lateral carinae converging to the style sockets, the distal margin between the latter acute-angulate emarginate and considerably deeper than wide. Styles simple, tapering, (less to more than) three times as long as broad, separated by a distance less than the length of one of them. Internal genicular lobes of median and caudal femora armed with a small spine, others unarmed. Ventro-cephalic margins of cephalic femora with a single minute spine, others unarmed. Cephalic tibiae armed as in *siskiyou*.

Allotype.— ♀ ; Yosemite, Mariposa County, California. August 15, 1927. (W. B. Cartwright; in grass.) [U. S. National Museum.]

Size larger and more graceful than a female of *brunneus* before us.[10] Head similar. Pronotal disk proportionately narrower, the lateral carinae less strongly divergent caudad and the constriction meso-cephalad much weaker and broader as in this sex of *tehachapi* here described. Tegmina represented by large, evenly rounded, overlapping pads which project briefly beyond the pronotum. Penultimate tergite with caudal margin bluntly and very weakly obtuse-angulate produced mesad. Ultimate tergite with a median impression into which the supra-anal plate is fused, the lateral angles formed there by the caudal margin making small sharply angulate projections. Cerci as in *brunneus;* small, stout, tapering to the acute apex, distinctly over twice as long as proximal width. Ovipositor as in *brunneus* and as here described for *tehachapi*. Subgenital plate much as in *brunneus;* rather short, with margins curving to become transverse before rounding into a rounded median emargination.

Coloration as described for *siskiyou*, the microscopic brown flecks generally much thicker giving a finely mottled bister general appearance. Carinae of pronotal disk margined on lateral lobes with dark brown, the disto-ventral section of the enlarged portion of the caudal femora shining blackish brown.

The measurements of a paratype male from Sequoia, Tuolumne County, California, at 4452 feet, taken September 4, 1907, in the author's collection, follow those of the type. Length of body ♂ 17.2 and 18, ♀ 19; length of pronotum ♂ 4.8 and 5.2, ♀ 5.9;

[10] From Winters, Yolo County, California, August 6, 1929, (P. W. Oman), in the author's collection, (see pl. III, fig. 11).

caudal width of pronotal disk ♂ 3 and 3.7, ♀ 3.7; exposed length of tegmen ♂ 1.8 and 1.9, ♀ 1.3; length of caudal femur ♂ 16.7 and 17.3, ♀ 24; width of caudal femur 3.2 and 3.6, ♀ 4.1; length of ovipositor 18 mm.

The type was found on a road deeply covered with dust at night, with the aid of an electric torch. The spot was in the zone of oaks.

Idionotus tehachapi new species (Pl. II, fig. 5; pl. III, figs. 9 and 10)

The series shows this species to be the largest known of the genus. All the species of *Idionotus* are very similar in general appearance, the present being more slender than the others except *I. tuolumne* here described, the male tegmina projecting more strongly as in *I. siskiyou* here described and the male genitalia of a very different type from either of those species.

Females are much more difficult to distinguish, the present compared with that before us of *I. brunneus* Scudder (recorded in footnote under *tuolumne*) being larger and more slender, the ultimate tergite scarcely produced with margins rounded on each side of a median impression.

The coloration of all the present series is pale, as in the type of *siskiyou*. It is, however, evident that all of the species of *Idionotus* are of very similar coloration and generally heavier microscopic mottling may represent merely individual response to conditions of immediate environment.

Type.—♂; Paradise Valley, Tehachapi Mountains, Kern County, California. August 7, 1931. (E. R. Tinkham.) [Hebard Collection, Type No. 1244.]

Size large, form graceful for the genus. Head deep but cheeks considerably inflated, making the meso-ventral width very broad for the genus. Fastigium large, not sulcate, slightly less than twice width of proximal antennal joint. Face microscopically moderately impresso-punctulate. Pronotum as described for *siskiyou*, but like that of *tuolumne*, with disk proportionately narrower, the lateral carinae less strongly diverging caudad and the humeral sinus even weaker. Tegmina as in *siskiyou*. Ultimate tergite with caudal margin weakly but sharply obtuse-angulate produced mesad, this even weaker on preceding tergites (this blunter and very feebly indicated in the other species). Prosternum unarmed. Ultimate tergite not produced mesad, there with a transverse symmetrically trapezoidal impressed area (instead of the emargination found in *tuolumne*, the latero-

caudal apices so formed less acute than in that species). Cerci small, straight, cylindrical but strongly tapering to the apex which is bent inward at slightly more than a rectangle, this conical projection surmounted by a large feebly curved tooth; length of cercus approximately twice its basal width. Titillators springing from a transverse chitinous yoke, represented by two decurved adjacent cylindrical processes, each produced to terminate in a straight elongate spine directed ventrad. Subgenital plate as described for *siskiyou*, but with distal emargination broader and shallower, concave. Styles as in that species, separated by a distance approximately twice the length of one of them. Genicular lobes of femora with a minute spine (very rarely two) but external of cephalic usually and external of caudal often unarmed. Ventral femoral margins (in the series) armed with small spines as follows; cephalic internal 0 to 4 (usually 2), cephalic external 0, median internal 0 to 1 (very rarely), median external 0, caudal internal 1 to 6 (rarely), caudal external 0 to 3. Cephalic tibiae armed dorsad on outer margin with a proximal, median and distal spine.

Allotype.— ♀ ; same data as type. [Hebard Collection.]

Very similar generally to the females of the other known species but larger and more elongate; larger with longer limbs than male. Head and pronotum similar to that sex, but the latter proportionately slightly more elongate (shorter than in male in most Decticid genera). Tegmina represented by large, evenly rounded, overlapping pads, which project briefly beyond the pronotum. Dorsal abdominal tergites as described for male, but the projections even weaker. Ultimate tergite with a small median impression to which the supra-anal plate is fused, the lateral angles formed there by the caudal margin rounded and not sharply angulate, in this feature showing strongest difference from *brunneus*.[11] Cerci as in *brunneus;* small, stout proximad, tapering to the acute apex, slightly over twice as long as proximal width. Ovipositor elongate, weakly recurved, margins unarmed, a longitudinal carina present at apex on sides of valves, mesad on the dorsal and dorsad on the ventral valves. Subgenital plate more elongate with distal margins more convergent than in the females of *brunneus* or *tuolumne*, with lateral apices rounded-rectangulate and between a small subrectangulate median emargination.

General coloration dull cinnamon buff, individually varying to more brownish but only slightly darker. Only under the

[11] In which the caudal margin of the ultimate tergite is produced in a small node on each side of the median impression.

microscope seen to be minutely, generally and remarkably evenly tessellate with brown, this often concentrating to make the disto-ventral section of the enlarged portion of the caudal femora solid brown.

A series of twelve male and four female paratypes bear the same data as the type, the extremes measuring as follows. Length of body ♂ 19.5 to 23.5, ♀ 20.8 to 24.5; length of pronotum ♂ 5.8 to 6.1, ♀ 6.2 to 6.5; caudal width of pronotal disk ♂ 4.1 to 4.2, ♀ 3.9 to 4.2; exposed length of tegmen ♂ 3.7 to 4.1, ♀ .7 to 1.3; length of caudal femur ♂ 21.7 to 23.7, ♀ 24 to 24.8; greatest width of caudal femur ♂ 4.1 to 4.7, ♀ 4.8 to 4.8; length of ovipositor 18.7 to 20.2 mm. The series averages nearer the maximum measurements.

STEIROXYS Herman 1874

Undoubtedly the most baffling genus of the Decticinae of the United States, we feel that complete revision should still await further material, though extremely large series are now available. At present, however, we can state definitely that the genotype, *trilineatus* (Thomas) occurs through the Rockies (except probably on their western slopes) from southern Alberta to northern[12] Colorado.

We here select the type locality of *S. pallidipalpus* (Thomas) as Copenhagen, Utah. The type was a female and a topotypic series of both sexes secured three miles north of Mantua in the Wasatch Mountains of Utah at 5800 feet by Rehn and Hebard shows that it is probably not the insect which has generally been so referred and that *S. hendersoni* Caudell, described from Dry Lake, Utah, at 5500 feet, is actually a synonym.

Fulton's *strepens* of the mountains of Oregon is apparently a very distinct insect.

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[12] We have noted that Thomas' original record from "southeastern Colorado" is probably incorrect; *Proc. Acad. Nat. Sci. Phila.*, LXXXI, p. 406, (1929). In 1902 Scudder and Cockerell further quoted a record from northeastern New Mexico as having been published by Thomas which does not exist and is likewise, in our opinion, erroneous.

Explanation of Plates

PLATE II

(Figures are enlarged × 2)

Fig. 1.—*Pediodectes tinkhami* new species. Cephalic view of head. *Type*, male. Chinati Mountains, Texas.

Fig. 2.—*Eremopedes covilleae* new species. Lateral view. *Type*, male. Twenty miles north of Chisos Mountains, Texas.

Fig. 3.—*Ateloplus splendidus* new species. Lateral view. *Type*, male. Barstow, California.

Fig. 4.—*Idiostatus magnificus* new species. Lateral view. *Type*, male. Cedar Peak, Warner Mountains, California.

Fig. 5.—*Idionotus tehachapi* new species. Lateral view. *Type*, male. Paradise Valley, Tehachapi Mountains, California.

PLATE III

(Figures all much enlarged.)

Fig. 1.—*Pediodectes tinkhami* new species. Dorsal view of distal portion of supra-anal plate and of the cerci. *Type*, male. Chinati Mountains, Texas.

Fig. 2.—*Pediodectes tinkhami* new species. Lateral outline of ovipositor. *Allotype*, female. Chinati Mountains, Texas.

Fig. 3.—*Eremopedes covilleae* new species. Dorsal view of distal portion of supra-anal plate and of the cerci. *Type*, male. Twenty miles north of Chisos Mountains, Texas.

Fig. 4.—*Ateloplus splendidus* new species. Dorsal view of distal portion of supra-anal plate and of the cerci. *Type*, male. Barstow, California.

Fig. 5.—*Ateloplus notatus* Scudder. Dorsal view of distal portion of supra-anal plate and of the cerci. Male. Near Jacumba, California.

Fig. 6.—*Idiostatus magnificus* new species. Dorsal view of distal portion of supra-anal plate and of the cerci. *Type*, male. Cedar Peak, Warner Mountains, California.

Fig. 7.—*Idionotus siskiyou* new species. Dorsal view of distal portion of supra-anal plate and of the cerci. *Type*, male. Thrall, California.

Fig. 8.—*Idionotus tuolumne* new species. Dorsal view of distal portion of supra-anal plate and of the cerci. *Type*, male. El Portal, California.

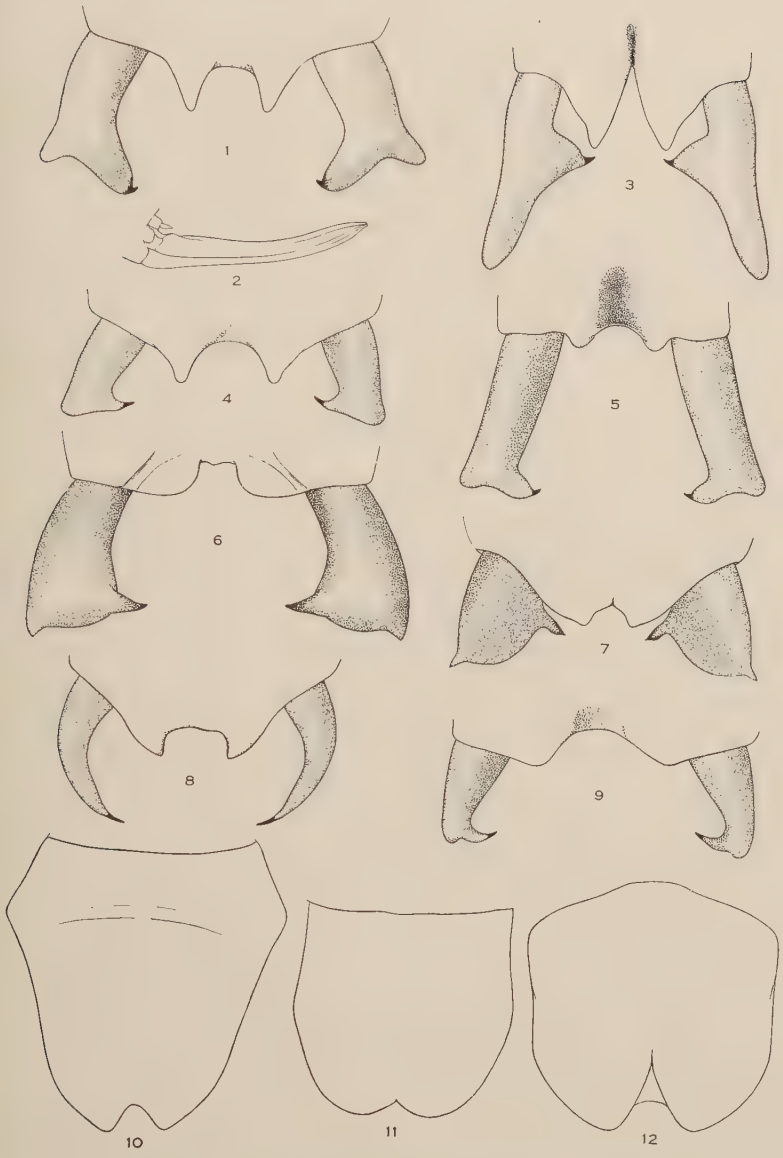
Fig. 9.—*Idionotus tehachapi* new species. Dorsal view of distal portion of supra-anal plate and of the cerci. *Type*, male. Paradise Valley, Tehachapi Mountains, California.

Fig. 10.—*Idionotus tehachapi* new species. Ventral view of subgenital plate. *Allotype*, female. Paradise valley, Tehachapi Mountains, California.

Fig. 11.—*Idionotus brunneus* Scudder. Ventral view of subgenital plate. Female. Winters, California.

Fig. 12.—*Idionotus tuolumne* new species. Ventral view of subgenital plate. *Allotype*, female. Yosemite, California.

HEBARD—NORTH AMERICAN ORTHOPTERA



HEBARD—NORTH AMERICAN ORTHOPTERA

A REVISION OF THE NORTH AMERICAN SPECIES BELONGING TO THE GENUS COENOSIA MEIGEN AND RELATED GENERA

(DIPTERA: MUSCIDAE)

PART I. THE SUBGENERA NEODEXIOPSIS, COENOSIA, HOPLOGASTER AND RELATED GENERA ALLOGNOTA, BITHORACOCHAETA AND SCHOENOMYZA

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(Plates IV–VII)

The subfamily Coenosiinae may be divided into two parts according to the number of bristles present on the presutural area of the mesonotum. One tribe possesses two pairs of presutural dorsocentral bristles, and the other, the Coenosiini, possesses one such pair. The present revision is restricted to a study of those species having only one pair of presutural dorsocentral bristles. In North America these species are representative of the genera *Coenosia* Meigen, *Allognota* Pokorny, *Bithoracochaeta* Stein, and *Schoenomyza* Haliday.

I have treated the genus *Coenosia* in the sense of *Caricea* (Rondani), having accepted Westwood's (60)[1] designation of *Coenosia tigrina* (Fabricius) as type of *Coenosia*. This species is, in my opinion, the second listed by Meigen in his original series. To the group *Coenosia sens.-str.* of authors I have given the name *Limosia* Robineau-Desvoidy, the type of which is *Limosia campestris* Robineau-Desvoidy by designation of Coquillett (4), a species which I am led to believe is congeneric with *Musca geniculata* Fallén, Rondani's type of *Coenosia* Meigen. In *Limosia* I have included the species belonging to Malloch's genus *Macrocoenosia*.

I have subdivided the genus *Coenosia* into four subgenera, namely, *Coenosia* Meigen, *Neodexiopsis* Malloch, *Limosia* Robineau-Desvoidy, and *Hoplogaster* Rondani. Within the sub-

[1] Figures in parenthesis refer to literature cited at end of this part.

genus *Neodexiopsis* I have included the species *Coenosia ovata* Stein, *C. tibialis* Stein, and those belonging to the genus *Xenocoenosia* Malloch. These species possess a preapical bristle on posterior surface of hind femur, whereas species belonging to other subgenera lack such a bristle.

Synonymy

I have limited the citation of synonymy to the more important contributions dealing with species and genera occurring in North America that have appeared since the publication of Aldrich's catalogue in 1905 (1). This catalogue contains the more important references to synonymy up to that date, though by no means all. Because of the need for economy I have omitted to a large degree references to literature containing species that occur in North America that do not deal primarily with the North American fauna, such as those of many European authors. In this case the worker is referred to Stein's catalogue of palaearctic species published in 1907 (48), and to the bibliography given at the close of this part. However, where it has seemed necessary to make my position clear I have dealt with such problems in synonymy and nomenclature in the text irrespective of such limitations.

Characters

Many new or little used characters have been introduced in the keys for distinguishing species in the hope that they may be of some value in the recognition of the local fauna. Undoubtedly some of these characters will be difficult to appraise on first acquaintance, hence a fuller explanation is here offered with a view to their clarification.

The length of the frontal vitta is taken from the anterior ocellus to base of antennae; the width, at a point immediately cephalad of anterior ocellus.

The width of antenna and parafacial, or height of cheek, is measured when viewed in profile; that of parafacial is taken at the base of antennae unless otherwise stated; that of cheek is measured at narrowest distance between ventral margin of head and that of eye.

The presutural pair of dorsocentral setulae is the first pair of setulae on the planes of dorsocentral bristles; the propleural

callosity is a small sclerite adjacent the base of fore coxa, on which are usually a smaller and a larger bristle.

I have enumerated the abdominal terga as follows: first visible tergum, terga 1 + 2; second visible tergum, tergum 3; third, tergum 4; fourth, tergum 5; followed successively by the basal sclerite of hypopygium and tergum 9 (anal sclerite).

All bristles occurring near or at the apex of tibiae are designated as apical bristles. These include the antero-, postero-, and mid dorsal bristles, which are normally placed preapicad.

The apical posteroventral bristle of mid tibia has been used in an arbitrary manner to split the species belonging to Limosia into two groups, according to whether such bristle is longer or shorter than the diameter of tibia where situated. The species *incisurata*, *fuscifrons*, *modesta*, and *nivea* have the posteroventral bristle of mid tibia distinctly shorter than diameter of tibia; the species *lata*, *atrata*, *compressa*, and *triseta* have such bristle longer than tibial diameter. This character apparently varies in such species as *pallipes*, *frisoni*, *antennalis*, and *impunctata*, in which case such species have been included in both captions in the keys.

The distance between the apical anterodorsal and apical mid dorsal bristles of hind tibia is measured when the tibia is viewed at right angles. In the species *triseta*, *pallipes*, and *frisoni* the apical anterodorsal and apical mid dorsal bristles are approximated, being situated on nearly the same transverse plane, whereas in *atrata*, *incisurata*, *fuscifrons*, these bristles are situated on distinctly separated transverse planes, the apical mid dorsal bristle being placed decidedly basad of apical anterodorsal bristle.

Key to genera

1. Costal vein extending to apex of vein M_{1+2} 2
   Costal vein not extending to apex of vein M_{1+2}, terminating about apex of vein R_{4+5} ..... *Allognota* Pokorny
2. Thorax with 2 pairs of postsutural dorsocentral bristles. *Bithoracochaeta* Stein
   Thorax with 3 pairs of postsutural dorsocentral bristles 3
3. Frontal vitta longer than wide; mid tibia with no mid anteroventral bristle ..... *Coenosia* Meigen
   Frontal vitta as wide as long; mid tibia with a mid anteroventral bristle ..... *Schoenomyza* Haliday

ALLOGNOTA Pokorny

Allognota Pokorny, Wien. Ent. Zeitg., XII, p. 64, 1893. Malloch, Trans. Amer. Ent. Soc., XLIV, p. 281, 1918. Malloch, Ent. News, XXXII, p. 106, 1921.

The genus *Allognota* was erected by Pokorny for the reception of the sole species *Coenosia agromyzina* (Fallén). The new genus was distinguished from its allies by the unusual foreshortening of the costal vein at about the apex of vein R_{4+5}, and by the noticeable approximation of cross veins *r–m* and *m–cu*. With the exception of Meade (28) and Pandellé (31) the genus has been recognised by nearly all subsequent workers in Europe. Malloch in 1918 discovered the genus occurring in North America, and forthwith described the native form *Allognota semivitta* from Illinois.

Allognota semivitta Malloch

1918. *Allognota semivitta* Malloch, Trans. Amer. Ent. Soc., XLIV, p. 282. 1918. Frison, Bull. Nat. Hist. Surv. Ill., XVI, p. 196, 1927.

The species is yellowish in contrast with the blackish appearance of *A. agromyzina*. In this respect *A. semivitta* superficially resembles *Coenosia modesta* Loew, from which it may be readily distinguished by the length of costal vein.

ILLINOIS: 1 ♂, 1 ♀, Havana, June 1918, (Malloch), [Ill. N.H.S.].
NEBRASKA: 1 ♀, [C.U.].
NEW YORK: 1 ♀, Ithaca, [C.U.].
ONTARIO: 1 ♀, Pt. Pelee, June 22, 1925, (G. S. Walley); 1 ♂, 1 ♀, June 18, 1927, (F. P. Ide), [C.N.C.].

BITHORACOCHAETA Stein

Bithoracochaeta Stein, Arch. f. Naturgesch., LXXVII, A, hft. 1, p. 177, 1911. Stein, Arch. f. Naturgesch., LXXXIII, (1917), A, hft. 1, p. 157, 1919. Stein, Arch. f. Naturgesch., LXXXIV, (1918), A, hft. 9, p. 93, 1920. Malloch, Ent. News, 1921, XXXII, p. 106, 1921. Curran, Sci. Survey Porto Rico & Virgin Isl., (N. Y. Acad. Sci.), XI, p. 87, 1928.
Caricea Williston (not Robineau-Desvoidy), Man. N. A. Diptera, p. 336, 1908.

The genus was erected by Stein for the reception of two American species, *Anthomyia despecta* (Walker) and *B. annulata* Stein, of which the former was made the genotype. The genus is apparently distributed in parts of Mexico, on the islands of the Caribbean Sea, in the States bordering the Gulf of Mexico and Atlantic Ocean, as well as in parts of South America.

The genus may be readily distinguished by the presence of two pairs of postsutural dorsocentral bristles, and by the peculiar

arrangement of the bristles on the hind tibia. The latter has a strong bristle at middle of posteroventral surface, and an anteroventral bristle situated distinctly basad of the mid anterodorsal bristle.

This is the genus appearing under the name of *Cariciella* in Malloch's description of *Neodexiopsis* (18). The proposed genus was never described due to the fact that Malloch later recognised its synonymy with *Bithoracochaeta*,[2] and had the printer delete its description from his paper.

Bithoracochaeta leucoprocta (Wiedemann) (Figs. 6, 22, 41)

Anthomyia leucoprocta Wiedemann, Auss. Zweifl. Ins., II, p. 433, 1830.
Anthomyia despecta Walker, Dipt. Saund., p. 364, 1856. Stein, Zeitschr. f. Hymen. u. Dipt., I, p. 195, 1901.
Anthomyia antica Walker, Dipt. Saund., p. 367, 1856. Stein, Zeitschr. f. Hymen. u. Dipt., I, p. 186, 1901. Stein, Ann. Mus. Nat. Hungarici, II, p. 483, 1904.
Coenosia pipunculina Thomson, Dipt. Eugen. Resa, p. 559, 1868.
Limnophora rufipes Bigot, Ann. Soc. Ent. France, ser. 6, v, (1884), p. 272, 1885.
Hydrophoria calopus Bigot, Ann. Soc. Ent. France, ser. 6, v, (1884), p. 275, 1885.
Coenosia femoralis van der Wulp, Biol. Centr.-Amer., Dipt., II, p. 345, 1896. Frison, Bull. Ill. Nat. Hist. Surv., XVI, p. 197, 1927.
Coenosia insignis Stein, Berl. Ent. Zeitschr., XLII, (1897), p. 257, 1898. Stein, Ann. Mus. Nat. Hungarici, II, p. 483, 1904.
Caricea insignis Williston, Manual N. A. Dipt., p. 335, 1908.
Caricea antica Johnson, Bull. Amer. Mus. Nat. Hist., XXXII, p. 78, 1913.
Bithoracochaeta leucoprocta Stein, Arch. f. Naturgesch., LXXXIII, (1917), A, hft. 1, p. 157, 1919. Stein, Arch. f. Naturgesch., LXXXIV, (1918), A, hft. 9, p. 93, 1920. Malloch, Ent. News, XXXII, pp. 44, 107, 1921. Johnson, Occ. Pap. Boston Soc. Nat. Hist., No. 7, p. 238, 1925. Curran, Sci. Survey Porto Rico & Virgin Isl., (N. Y. Acad. Sci.), XI, p. 87, 1928.

I have tentatively accepted the synonymy given by Malloch (19) regarding *femoralis* and *leucoprocta*, after having examined the female cotype specimens of *femoralis* in the collection of the Illinois State Natural History Survey at Urbana. There is a second species belonging to the genus recorded from Porto Rico, namely *B. varicornis* (Coquillett), which may be distinguished from *leucoprocta* by the blackish color of mid and hind femora.

FLORIDA: 2 ♂, 4 ♀, Lakeland, May 6, 1916, (J. C. Bradley), [C.U.]. 2 ♂, St. Petersburg, Feb. 15, 1924, (E. T. Cresson), [A.N.S.P.]. 1 ♀, St. Augustine, April 4, 1911.

[2] From unpublished notes belonging to Dr. J. M. Aldrich.

GEORGIA: 1 ♂, Billy's Island, Okefenokee Swamp, June 1912; 2 ♂, 1 ♀, June 15, 1912 [C.U.].

MISSISSIPPI: 1 ♂, 1 ♀, Gulfport, June 14, 1917, (R. C. Shannon), [H.C.H.].

LOUISIANA: 1 ♂, 1 ♀, New Orleans, March 28, 1905, (J. S. Hine), [H.C.H.].

TEXAS: 1 ♀, Galveston, June, [U.S.N.M.].

COENOSIA Meigen

Coenosia Meigen, Syst. Beschr. Zweifl. Ins., v, p. 210, 1826. Stein, Ann. Mus. Nat. Hungarici, II, p. 483, 1904. Williston, Manual N. A. Dipt., p. 336, 1908. Coquillett, Proc. U. S. Nat. Mus., XXXVII, p. 526, 1910. Malloch, Bull. Brooklyn Ent. Soc., XII, p. 36, 1917. Stein, Arch. f. Naturgesch., LXXXIII, (1917), A, hft. 1, p. 158, 1919. Stein, Arch. f. Naturgesch., LXXXIV, (1918), A, hft. 9, p. 93, 1920. Britton, Bull. 31, Conn. Geol. Nat. Hist. Surv., p. 199, 1920. Malloch, Ann. Mag. Nat. Hist., (9), x, p. 575–576, 1922.

Anthomyza Zetterstedt, p. p., Ins. Lapponica, p. 694, 1840.

GENOTYPE: *Musca tigrina* Fabricius.

The type of the genus *Coenosia* Meigen was first designated by Westwood (60) in 1840 when he named *Musca tigrina* Fabricius as type.

It has been doubted by many authors whether Fabricius' species was truly represented in the list of original species belonging to the genus in the belief that Meigen's *tigrina* did not represent Fabricius' species. Meigen himself (29) cited *Musca quadrum* Fallén (= *Anthomyia duplicata* Meigen) as a synonym of *tigrina* Fabricius; Macquart (13) gave *Caricea communis* Robineau-Desvoidy and *Musca quadrum* Fallén as synonyms of *tigrina* Fabricius: Zetterstedt (62), Schiner (38), Stein (48), and Séguy (43) believed that Meigen's *tigrina* was in some respects identical with *Anthomyia ciliatocosta* Zetterstedt; Schnabl (41) recognised the strong similarity between Robineau-Desvoidy's *communis* and Zetterstedt's *Anthomyza anceps*. I had the privilege of examining the specimens under *Coenosia tigrina* in the Meigen collection at Paris through the courtesy of Mr. Séguy, and found two species represented in the series, namely *Musca tigrina* Fabricius and a female of *Musca quadrum* Fallén. This identification was very kindly verified by Mr. Séguy, who was furnished with specimens of *ciliatocosta*, *anceps*, and *duplicata* from the collections of Mr. Ringdahl and Mr. Collin. The results from such a study of Meigen's specimens under *tigrina* confirmed the earliest citations of Macquart, and clarified the issues brought

up from time to time in the literature regarding the identity and the relationships of the above species. With this understanding of the problem I have concluded that Meigen knew *tigrina* Fabricius, and that this was the species he had in mind when establishing the genus *Coenosia*. Thus I have considered *Musca tigrina* Fabricius available for type designation, and further, that Westwood's (60) action to this effect may be considered valid as construed under the rules of the International Committee on Zoological Nomenclature pertaining to type fixation by subsequent designation.

One objection to the selection of *Musca tigrina* Fabricius as type of *Coenosia* is the fact that such an act transgresses the recommendation of the Committee to authors when selecting types by subsequent designation. It is recommended that if some of the original species have later been classified in other genera, preference should be shown to the species still remaining in the original genus. Applying this recommendation to the case of *tigrina* we find that in 1830, four years after the erection of *Coenosia*, Robineau-Desvoidy (34) is assumed to have described that species under the name *Caricea communis* in his newly formed genus *Caricea*. Both Macquart (13) and Westwood (60) considered that the species *tigrina* belonged to *Caricea*, that group being considered a part of *Coenosia*. However helpful this recommendation may be to authors when faced with the problem of type selection I doubt whether it would be in the best interests of systematic entomology to make it a rule governing type selection. Neither do I believe that it should be of such consequence as to render inadmissible the action of any subsequent author in selecting a genotype, provided such designation was in accordance with the rules governing the same.

Rondani in 1866 (36) designated *Musca geniculata* Fallén, the twentieth species of the original series, as type of *Coenosia*. This concept regarding the genus has formed the basis for the traditional treatment of the genus by subsequent authors. The validity of Rondani's designation rests on the acceptance of the recommendation made by the Committee to eliminate all species from among which the type might be chosen that have been removed to other genera previous to the time of type selection.

Such procedure would render Westwood's prior action inadmissable, and validate Rondani's designation.

In 1911 Schnabl and Dziedzicki (42) designated *Coenosia sexnotata* Meigen, the fifth species of the original series, as type of *Coenosia*, a choice repeated by Karl (10) in 1928. The prior claims of Rondani, if not of Westwood, preclude the possibility of regarding such type as valid.

The genus *Coenosia* was proposed by Meigen for the reception of twenty eight nominal species, sixteen of which may be regarded as falling within the modern concept of the genus in its broad sense, and five have since been placed in other genera. Of these sixteen species, the second, namely *Coenosia tigrina* Meigen, has been regarded by numerous authors as not the true *tigrina* of Fabricius, owing apparently to certain discrepancies in Meigen's description relating to the wings, and to the fact that *Musca quadrum* Fallén is cited as a synonym of the species. An examination of the three specimens under *tigrina* in Meigen's collection at Paris has revealed that the series is a mixed one comprising a male and female specimen of *Musca tigrina* Fabricius and a female specimen of *Musca quadrum* Fallén. It is evident that in reading Meigen's description of *tigrina* with the above three specimens in mind that the description is a composite one, commencing with that of specimens of *tigrina* Fabricius and lapsing into that of *quadrum* Fallén in so far as the wings are concerned. Curiously enough Meigen had himself described Fallén's species earlier in the same work under the name *Anthomyia duplicata*, a name which will stand owing to Fallén's name being preoccupied by Fabricius.

Of the remaining species in the generic series four have been placed in synonymy, and three have not since been recognised in the literature, thereby leaving a residue of nine valid species in the original series as belonging to *Coenosia* of authors, namely, *tigrina*, *geniculata*, *pedella*, *sexnotata*, *intermedia*, *means*, *ambulans*, *perpusilla*, and *pumila*.

Robineau-Desvoidy (34) in 1830 did not recognise Meigen's genus and species. Such coenosian species of his as were accepted by subsequent workers were listed by him in the new genera *Caricea*, *Limosia*, and *Palusia*.

Macquart in 1835 (13) however included under the genus *Coenosia* many of Robineau-Desvoidy's species belonging to *Caricea, Limosia,* and *Palusia.* He divided the genus into two parts, the first of which is named *Caricea* and included *Musca tigrina* Fabricius. The species *Caricea communis* Robineau-Desvoidy and *Musca quadrum* Fallén are cited by Macquart as synonyms of *tigrina,* and further that *Limosia campestris* and *Palusia testacea* of Robineau-Desvoidy are synonyms of *Coenosia albicornis* Meigen.

Zetterstedt in 1840 (61) and during later years (62) listed many of the coenosian species of Scandinavia as a component part of *Anthomyza.* Westwood in the same year (60), designated *Musca tigrina* Fabricius as type of Coenosia, and further stated that the species more specifically belonged to the subgenus *Caricea,* as formerly indicated by Macquart.

The faunal list of Schiner (38) in 1862 revealed little change from the original treatment of the group. He concluded that the specimens named by Meigen as *Coenosia tigrina* were not in part identical with the true *tigrina,* but were in all probability identical in part with those described by Zetterstedt as *Anthomyza ciliatocosta,* as already indicated by that author (62).

In 1866 Rondani (36) divided Meigen's genus *Coenosia* into four or five parts, designating *Musca geniculata* Fallén as type of *Coenosia. Musca tigrina* Fabricius is proposed as type of *Caricea* on the assumption that *Caricea communis* and *C. vulgaris* are synonyms of *tigrina* Fabricius. *Coenosia nemoralis* Meigen (*Musca mollicula* Fallén) is made type of the new genus *Hoplogaster; Coenosia meditata* Meigen, the type of the new genus *Macrorchis;* and *Coenosia monilis* Meigen, the type of the new genus *Chelisia.* Rondani's classification of the coenosian genera has formed the basis for the treatment of such a group by nearly all subsequent workers, commencing with Meade (28) in his study of the British species.

Strobl (54) in listing the fauna of the Austrian Tyrol in 1893 considered the genus *Coenosia* in its broad original sense, thereby occasioning the subsequent criticism of this work by Pokorny (33).

In the same paper Pokorny erected the genus *Centriocera* with type *Coenosia decipiens* Meigen, a species regarded as congeneric

with *C. geniculata* (Fallén), Rondani's type of *Coenosia*. Hence *Centriocera* has been considered by most workers as a synonym of *Coenosia*.

In 1896 van der Wulp (56) gave an arbitrary description of the genus *Coenosia*, placing therein six Mexican species. I have been able to examine specimens of three of these species in the collection of the Illinois State Natural History Survey at Urbana, and have found that all of them would be regarded in the light of recent studies as belonging more specifically to other groupings than *Coenosia*, for example, *Coenosia femoralis* is representative of the genus *Bithoracochaeta* (49), and *C. macrocera* and *C. punctulata* of *Xenocoenosia* Malloch (18).

Stein in 1898 (45), in his first contribution on the North American Anthomyiidae, mentioned that the genus *Coenosia* should be restricted to those species having only one pair of presutural dorsocentral bristles. However in Stein's catalogue of the palaearctic forms published in 1907 we still find such species as *C. albifrons* and *C. triangula*, which possess two pairs of presutural dorsocentral bristles, listed in the genus *Coenosia*.

In 1899 Pandellé (31), in his study of the muscoid flies of France, employed the genus in its broad sense, placing therein three subgenera, *Coenosia*, *Schoenomyza*, and *Atherigona*. In the subgenus *Coenosia* are lumped many species which have been regarded by recent authors as types of groups meriting generic recognition, e.g., *mollicula* Fallén, *tigrina* Fabricius, *agromyzina* Fallén, *monilis* Meigen, and *verna* Fabricius. On the other hand, the species *C. triangula* (Fallén) and *C. albifrons* (Zetterstedt) of authors are transferred to the genus *Limnophora*, a step in accordance with the previous contentions of Strobl (54) and Schnabl (39).

In 1901 Coquillett (4) arbitrarily designated *Limosia campestris* Robineau-Desvoidy as type of the genus *Limosia*, and *Palusia testacea* Robineau-Desvoidy as type of the genus *Palusia*. *Coenosia dubia* Macquart, the second species of the original series, is designated type of *Eriostyla* Lioy.

In 1905 Aldrich (1) listed the North American species of *Coenosia* according to the classification adopted by Rondani (36) and Stein (45)

Stein however in 1907 (48), as well as in previous papers dealing with the European fauna, had used Robineau-Desvoidy's genus *Caricea* in the sense of *Lispocephala* Pokorny in contradiction to his earlier treatment of the genus as allied to *Coenosia*. Later Stein (45) returned to his earlier interpretation of the group, but in explanation of his attitude at the time of the publication of his palaearctic catalogue he stated (50) that in restudying Robineau-Desvoidy's original description he was unable to recognise with any degree of certainty any of the original species except *Caricea erythrocera*. This fact had resulted in his inability to accept *Caricea communis* as a synonym of *Coenosia tigrina* (Fabricius), or as a synonym of *Helina anceps* (Zetterstedt) according to the recent opinions of Schnabl (41). He therefore arbitrarily chose *Caricea erythrocera* as typifying the genus. Stein in all later contributions (51) (52) (53) considered the genus *Coenosia* as limited to those comparatively few anthomyid genera which possessed only one pair of presutural dorsocentral bristles on the thorax. The groups *Caricea* and *Hoplogaster* were invariably maintained as subgenera of *Coenosia*, the former segregate being interpreted according to Rondani's conception.

Coquillett (5) in his list of type species of North American genera of diptera cited *Musca geniculata* Fallén as type of *Coenosia* according to the prior designation of Rondani. The genera *Caricea*, *Limosia*, *Palusia*, *Eriostyla*, *Centriocera*, and *Limnospila*, are cited as synonyms of *Coenosia*, the types of which are given as *Musca tigrina* Fabricius, *Limosia campestris*, *Palusia testacea*, *Coenosia dubia* Macquart, *Musca pedella* Fallén, and *Aricia albifrons* Zetterstedt respectively. Concerning these species it may be pertinent to mention the following points: *Musca tigrina* is assumed to be conspecific with the supposed species 2 to 7 of the original caricean series; *Limosia campestris* and *Palusia testacea* were cited by Macquart (13) as synonyms of *Coenosia albifrons* Meigen, a species which Stein (48) has regarded as partly identical with *tricolor* Zetterstedt and partly with *pumila* Fallén; *Palusia testacea* has been cited as identical with *Coenosia pumila* Fallén by Zetterstedt (62), and as possibly a synonym of *Coenosia tricolor* (Zetterstedt) by Stein (48); *Coenosia dubia* has been considered congeneric with *Musca*

geniculata; and *Musca pedella* Fallén is regarded as the same species as *Coenosia decipiens* Meigen, a true *Coenosia* of authors.

In 1911 Schnabl and Dziedzicki (42) regarded the genus *Coenosia* as consisting of three subgenera, *Palusia* in part, *Coenosia sens.-str.*, and *Caricea* in part. The group *Hoplogaster* is accorded generic rank. To *Palusia*, of which *Centriocera* is cited as a synonym, is designated the type *P. femoralis* Robineau-Desvoidy, a species recorded by Stein (48) as a synonym of *Coenosia geniculata* (Fallén); to *Coenosia* is given the type *Coenosia sexnotata* Meigen; to *Caricea*, the type *Caricea tigrina* (Fabricius), of which *C. communis* is recognised as a synonym. Previously Schnabl (39a) (41) had claimed that the genus *Caricea* was composed of species that were not congeneric. In order to retain the genus he had arbitrarily chosen *C. communis* as the type, a species which he had considered as identical with *Helina anceps* (Zetterstedt), and close to *Enoplopteryx ciliotocosta* (Zetterstedt) and *E. obtusipennis* (Fallén). In this he was apparently influenced by the statement of Zetterstedt himself (62), but was acting contrary to the opinions of Macquart, Rondani, and Stein.

Malloch in 1917 (15) and again in 1921 (20) gave a key to the various North American genera comprising the subfamily Coenosiinae. In his earlier paper he regarded the characters defining such genera as *Caricea*, *Dexiopsis*, and *Limnospila*, as not dependable, and hence merged the species belonging to them with those of *Coenosia*. Later he regarded *Limnospila* as more closely allied to *Limnophora* than to *Coenosia*, and concluded that the genus *Dexiopsis* had been wrongly recorded by Stein as occurring in North America, since the described species *Dexiopsis basalis* Stein was not representative of that genus, having only one pair of presutural dorsocentral bristles instead of two such pairs. Forthwith in 1920 Malloch (18) erected the genus *Neodexiopsis* for the reception of the single species *Dexiopsis basalis* Stein, and in 1921 he raised *Caricea* to generic rank. Further contributions were made by Malloch (24) (26) concerning the status of *Coenosia* and *Caricea* in papers dealing with the African and Australian genera of Coenosiinae. In a synopsis of the North American species belonging to *Hoplogaster*, Malloch (25) doubtfully recognised the group as distinct from *Coenosia*.

More recently Séguy (43), in dealing with the dipterous fauna of France, followed closely the later definitions of Stein regarding the limitations of coenosian genera. *Hoplogaster* is given generic rank, but *Caricea* is suppressed, the species *C. tigrina* and *C. humilis* being included with those of *Coenosia.*

In 1928 Karl (10) in his study of the German species of Muscidae regarded the genus *Coenosia* as one of three genera comprising the tribe Coenosiini, a group which he distinguished from the tribe Chelisiini by the number of presutural dorsocentral bristles on mesonotum, whether one or two pairs. The group *Hoplogaster* is mentioned only as of subgeneric importance, and *Caricea* is not recognised. He repeated Schnabl and Dziedzicki's former designation of *C. sexnotata* Meigen as type of *Coenosia.*

I have concluded that the genus *Coenosia sens.-lat.*, as represented in North America, is one of four genera belonging to the subfamily Coenosiinae, all of which possess only one pair of presutural dorsocentral bristles on the mesonotum. From *Allognota* the genus may be distinguished by the normal length of the costal vein, which extends to apex of vein M_{1+2}; from *Bithoracochaeta*, by the presence of three pairs of postsutural dorsocentral bristles; and from *Schoenomyza*, by the proportionately narrower frontal vitta, and by the lack of a mid anteroventral bristle on mid tibia. The genus, in my opinion, consists of four subgenera, namely *Coenosia sens.-str.* (*Caricea* of authors) with type *Musca tigrina* Fabricius; *Limosia* Robineau-Desvoidy (*Coenosia* of authors) with type *Limosia campestris* Robineau-Desvoidy; *Hoplogaster* Rondani, with type *Musca mollicula* Fallén; and *Neodexiopsis* Malloch, with type *Dexiopsis basalis* Stein. The distinctions between such groups are given in the key to subgenera on page 73. I have included in the subgenus *Neodexiopsis* all the species comprising Malloch's genus *Xenocoenosia* as well as *Coenosia ovata* Stein, *C. rufitibia* Stein, and *C. simplex* Stein. The species belonging to Malloch's genus *Macrocoenosia* I have merged with *Limosia.*

Faunal Records

The earliest mention of the genus *Coenosia* occurring in North America was made by Macquart (14), when he described the species *Coenosia fuscopunctata.* So far as I know the type of this

species is lost. Coquillett (7) (44) (3) for a time determined specimens as this species which have proven to be conspecific with the cotypes of *Coenosia ovata* Stein.

The list of diptera in the British Museum, published in 1849, contains but one North American record of *Coenosia*, namely *Coenosia sexmaculata* Walker, a synonym of *C. tigrina* (Fabricius). The two remaining species listed under *Coenosia*, namely *spinosa* and *substituta*, belong to other genera.

Among the anthomyids in the William Saunders collection there are listed five species under *Coenosia* from the United States. In a second contribution four years later, Walker names an additional species. Of the former, the type of *Coenosia solita* Walker is missing from the Walker collection in the British Museum, and *Coenosia antica* is a synonym of *Bithoracochaeta leucoprocta* (Wiedemann). The species in the second paper is *Coenosia intacta*, a name preoccupied in the first paper, and a species identical with *Lispocephala erythrocera* (Robineau-Desvoidy).

Van der Wulp (55) in 1869 published the names of four anthomyid flies from Wisconsin, amongst which is recorded *Coenosia incisurata*. Loew (12) in 1872 described four nominal species under *Coenosia* from North American material sent to him by Osten Sacken, the types of which are deposited in the Museum of Comparative Zoology at Cambridge. Of these *C. tricincta* belongs to *Cordilura*. In 1878 Osten Sacken (30) issued the first catalogue of North American diptera, among which are included the names of fourteen nominal species belonging to *Coenosia*. *Caricea* is mentioned, but no species included.

In 1898 Stein (45) published his findings from a large collection of North American anthomyids, amongst which are included the names of twenty two species belonging to *Coenosia* and allied genera. This was followed in 1901 (46) by a critical review of Walker's species in the British Museum. In 1904 he (47) published the records of North American species found in the National Museums at Berlin and Budapest. Of the eleven species recorded from the Americas four are assigned to the northern continent, including *C. compressa* Stein, *C. calopyga* Loew, and *C. ovata* Stein.

During the years 1895 to 1902 Mrs. Slosson (44) published lists of insects collected by her in the alpine region of Mount Washington, New Hampshire, the diptera of which were mostly identified by Coquillett. Among the anthomyids are recorded the occurrence of eight nominal species under the generic name *Caricea*. Of the species mentioned, *C. fuscopunctata* is generally regarded as identical with *C. ovata* Stein, the true identity of *fuscopunctata* being unknown; *Coenosia albicornis* Meigen is, in my opinion, incorrectly recorded as occurring in North America. I am, however, unable to find the specimens on which this record is based. The species *nivea*, *lata*, and *nudiseta* belong to the subgenus Limosia, and *calopyga* and *ovata* to the subgenus *Neodexiopsis*.

In 1895 Johnson (7) published his first list of anthomyid flies occurring in Florida, among which are five nominally placed in *Caricea*. Of these only three may be considered with certainty as belonging to *Coenosia*. In 1900 Coquillett (3) recorded among the Alaskan fauna three coenosian species, two of which Johnson had previously reported in his Florida list.

In 1905 Aldrich (1) listed forty seven nominal species in *Coenosia*, of which thirteen were recorded from Mexico and the West Indies. Of the North American species listed I am unable to recognise *C. solita* and *C. fuscopunctata*. Of the remaining species sixteen are valid, in my opinion, fifteen are synonyms or belong to other genera, and one is a homonym. Following *Coenosia* are listed the genera *Dexiopsis* with two species; *Hoplogaster* with one species; and *Caricea* with seven nominal species. The European genus *Dexiopsis* as already indicated, does not occur on this continent so far as is known, the species *D. lacteipennis* (Zetterstedt) being incorrectly recorded as occurring in North America, and the species *D. basalis* Stein does not belong to this genus but to *Neodexiopsis* Malloch. Of the seven nominal species listed under *Caricea* only two may be said to belong to the group as limited by recent workers, whilst three are synonyms of species belonging to other genera.

In 1913 Johnson (8) published a second list of diptera from Florida, among which are recorded six species in *Coenosia*, and one in *Caricea*, the latter being a synonym of *Bithoracochaeta leucoprocta* (Wiedemann).

Stein in 1919 (52) compiled a list of the exotic muscoid flies of the world, in which he listed twenty five nominal species under *Coenosia* occurring in North America. Of this number four are recognised as synonyms, and one a homonym. In 1920 he (53) published his second large contribution on the North American Anthomyiidae. In *Coenosia sens.-lat.* are recorded twenty six nominal species, of which eleven are described as new. Of the latter I have considered *C. canescens*, *C. pallida*, and *C. argenticolor* as undoubtedly synonyms of *C. atrata* Walker, *C. modesta* Loew, and *C. argentata* Coquillett respectively.

Malloch in 1921 (22) (23) had given keys to thirty three species of *Coenosia*, of which sixteen had been recently described by him, and to three species of *Xenocoenosia* Malloch, a group which I have united with *Neodexiopsis*. In 1924 (25) there followed a key to four species of *Hoplogaster*. Cole and Lovett (2) listed three species of *Coenosia* from Oregon. Two of these including *Macrorchis nana* (Zetterstedt) may be considered as falling within the generic limits.

In 1925 Johnson (9) listed twenty species from New England under the genera *Neodexiopsis*, *Xenocoenosia*, *Coenosia*, *Caricea*, *Macrocoenosia*, and *Hoplogaster*, all of which would come within the limits of my interpretation of *Coenosia sens.-lat.* It seems evident that the species listed as *Xenocoenosia calophaga* (Loew) is none other than *Xenocoenosia calopyga* (Loew), a species listed as *Coenosia calopyga* Loew. Leonard in 1928 (11) listed twenty five species in *Coenosia* from New York State, of which I am doubtful concerning the occurrence of *C. geniculata* (Fallén) and *C. solita* Walker.

Systematic Treatment

Herein are recorded the presence of sixty seven species and two varieties in the genus *Coenosia sens.-lat.*, as restricted to North America, of which eighteen constitute new records. In the subgenus *Coenosia* are grouped two species; in the subgenus *Limosia* forty seven species and two varieties; in the subgenus *Hoplogaster* ten species; and in the subgenus *Neodexiopsis* eight species.

Diagnostic generic characters.—Frontal vitta longer than wide, and mid tibia without a mid anteroventral bristle; mesonotum with three pairs of postsutural dorsocentral bristles; costal vein extending to apex of vein M_{1+2}.

Key to Subgenera of Coenosia Meigen

1. Hind femur with a preapical bristle on anterodorsal, dorsal, and posterior surfaces . . . . . *Neodexiopsis* Malloch
   Hind femur with a preapical bristle on anterodorsal and dorsal surfaces only 2
2. Hind tibia with two closely adjacent bristles at middle, situated on anterodorsal and anterior surfaces respectively, the anteroventral surface with no bristle at middle; fore tibia with a stout mid ventral bristle at apex *Coenosia* Meigen
   Hind tibia with no closely adjacent bristles at middle, situated on anterodorsal and anterior surfaces respectively, the anteroventral surface with a bristle at middle; fore tibia with no stout mid ventral bristle at apex 3
3. Lower calyptra much larger than upper, protruding noticeably beyond margin of upper scale. *Limosia* Robineau-Desvoidy [3]
   Lower calyptra not much larger than upper, at most the membrane of lower scale slightly visible beyond the margin of upper scale . . . . . *Hoplogaster* Rondani

Subgenus **NEODEXIOPSIS** Malloch

Dexiopsis Stein (not Pokorny), Berl. Ent. Zeitschr., XLII p. 259, 1897. Stein, Arch. f. Naturgesch., LXXXIII, (1917), A, hft. 1, p. 155, 1919.

Neodexiopsis Malloch, Trans. Amer. Ent. Soc., XLVI, p. 162, 1920.

Xenocoenosia Malloch, Trans. Amer. Ent. Soc., XLVI, p. 162, 1920. Malloch, Ent. News, XXXII, p. 107, 1921. Malloch, Canad. Ent., LIII, p. 13, 1921. Huckett, Mem. 101, N. Y. (Cornell) Agr. Exp. Station, (1926), p. 835, 1928.

GENOTYPE: *Dexiopsis basalis* Stein.

The type of this subgenus was described by Stein (45) as a *Dexiopsis* Pokorny. As a result the genus was recorded by Aldrich (1) and Williston (60a) as occurring in North America. Both authors cited the occurrence of *Dexiposis lacteipennis* (Zetterstedt) in North America, a species which so far as I know

[3] The subgenus *Limosia* will be treated in part two of this series.

has not been recognised from this Continent. Their record of *lacteipennis* Zetterstedt may have been based inadvertently on the species of that name, belonging to the genus *Lispocephala*, of which *Coenosia intacta* Walker (59) is a synonym. Malloch (16) recognised Stein's error in placing *basalis* in the European genus *Dexiopsis*, and forthwith he proposed the new genus *Neodexiopsis* (18) for the reception of *Dexiopsis basalis* Stein. In the generic description of *Neodexiopsis*, comparative reference is made to *Cariciella*, a manuscript name given by Malloch to the group *Bithoracochaeta* Stein. The subgenus, as far as is recorded, is known only to occur in the Americas.

I have included within this group those species of the genus *Coenosia* which have a preapical bristle on the posterior surface of hind femur, in addition to the normal preapical bristle on anterodorsal and dorsal surfaces. This character is possessed by the species contained in Malloch's genera *Neodexiopsis* and *Xenocoenosia*, and in the species *Coenosia ovata* Stein, *C. rufitibia* Stein, *C. simplex* Stein, *C. macrocera* van der Wulp, and *C. punctulata* van der Wulp. The males of *Coenosia nigricoxa* Stein also possess this character, but I am unable to regard this species as any other than a true *Limosia;* the more so since I have been unable to see female specimens of this species, and it is in the female sex that the group *Neodexiopsis* is the more readily understood.

The species belonging to this group have a characteristic superficial appearance, the head being broad, the eyes relatively larger, and the abdomen in the male proportionately shorter and broader than in other groups comprising the genus. In addition the abdomen usually has a dorsocentral vitta and traces of paired spots as in *Coenosia sens.-str.* In the female sex the femora possess numerous black spinules along the ventral surface.

Key to Species of Neodexiopsis

1. Hind tibia with a strong bristle at middle of posterodorsal surface 2
   Hind tibia with no bristle at middle of posterodorsal surface . 4
2. Thorax with two short stout spines on humeral callosity; propleural bristles likewise stiff and spinelike; palpi yellow; hind tibia with no bristle at middle of anteroventral surface. *pectoralis* n. sp.

Thorax with setulae and bristles on humeral and propleural callosities normal, none erect and spinelike; palpi blackish; hind tibia with a bristle at middle of anteroventral surface 3

3. Abdomen with dorsocentral vitta and no trace of paired spots; third antennal segment sharply tapered apicad, three times as long as greatest width; cheeks narrower than breadth of parafacials at base of antennae . . . . *simplex* Stein

Abdomen with dorsocentral vitta and paired spots; third antennal segment not sharply tapered apicad, less than three times as long as greatest width; cheeks as wide as breadth of parafacials at base of antennae . . . . *basalis* Stein

4. Hind tibia with a mid anteroventral bristle; ocellar bristles strongly developed 5

Hind tibia with no mid anteroventral bristle; ocellar bristles weakly developed 6

5. Mid and hind femora more or less yellowish; third antennal segment extending for a distance equal to three-quarters length of face, distance between apex of antennae and oral margin equal to about breadth of third antennal segment; male with a thumblike membranous extension at anal angle of wing . . . . . *ovata* Stein

Mid and hind femora more or less blackish; third antennal segment extending almost to oral margin, distance between apex of antennae and oral margin much less than breadth of third antennal segment; male with no membranous thumblike extension at margin of anal angle of wing. *rufitibia* Stein

6. Males 7

Females 9

7. Hind femur clothed with dense fine setulose hairs on anteroventral surface, the distal bristle if present, situated at a level with the preapical bristle on anterodorsal surface; abdomen with polished bare areas on lateral aspects of terga 8

Hind femur with a series of long and short black bristles on anteroventral surface, the distal bristle situated at a level decidedly basad of preapical bristle on anterodorsal surface, at one-quarter to one-third the length of femur from apex; abdomen with no polished areas on lateral aspects of terga. *major* Malloch

8. Antennae entirely pale yellow; scutellum with apical bristles well developed, almost equal in size to basal pair of bristles. *calopyga* Loew

Antennae with second and third segments partly fuscous; scutellum with apical bristles shorter and weaker developed than basal bristles.....*floridensis* Malloch

9. Hind femur with distal bristle on anteroventral surface situated at a level decidedly basad of preapical bristle on anterodorsal surface, at one-third to one-quarter the length of femur from apex.....*major* Malloch.

Hind femur with distal bristle on anteroventral surface situated at a level with preapical bristle on anterodorsal surface.....10

10. Scutellum with apical bristles well developed, almost equal in size to basal pair of bristles.....*calopyga* Loew

Scutellum with apical bristles shorter and weaker developed than basal pair of bristles.....*floridensis* Malloch

Coenosia (Neodexiopsis) pectoralis new species

Female: head grayish, parafacials, cheeks and face uniformly whitish pruinescent; parafrontals darker; frontal vitta, from above, blackish, pollinose, divided along median plane by a slender grayish to brownish frontal triangle; from in front, entirely bronzey pruinescent; first and second antennal segments brownish, with grayish infuscation; third antennal segment entirely grayish black; palpi yellowish; proboscis polished, brownish. Thorax grayish, subshining, with three more or less distinct brownish vittae along mesonotum; prothoracic ventral plate yellowish. Abdomen reddish yellow, with traces of blackish subcuticular infuscation; viewed from behind with traces of a deeper reddish brown dorsocentral vitta and paired spots on tergum four. All coxae, femora and tibiae entirely yellowish; tarsal segments more or less brownish infuscated; wings yellowish tinged; veins brownish, paler basad; calyptrae tinged; halteres yellow.

Head with eyes separated by about one-third width of head; cephalic pair of parafrontal bristles shortish, equal in length to outer pair of vertical bristles; cephalic pair of ocellar bristles well developed; parafrontals, at base of antennae, when viewed in profile, prominent, as wide as average breadth of third antennal segment, and slightly wider than height of cheeks; third antennal segment extending for a distance fully equal to three-quarters length of face, distal half noticeably tapering; arista short pubescent to tip. Thorax with propleural bristle and presutural pair of dorsocentral setulae short and spinelike; in addition, the humeral callosities each have two or more stiff short spines. Fore femur with a series of short setulae on proximal half of anteroventral surface; fore tibia with a bristle at middle of posteroventral surface, apical bristles well developed; mid femur

with a series of short stiff setulae on proximal half of anteroventral surface, and with one or two bristles on anterior surface; mid tibia with a stout bristle on anterior and posterodorsal surfaces, the former situated distinctly apicad of the latter; hind femur with a dense series of black setulae on proximal half of ventral surface; hind tibia with a strong bristle at middle of anterodorsal and posterodorsal surfaces, situated at about the same level, with no bristle at middle of anteroventral surface.

Length, 5 mm.

Type.—♀; Bear Wallow, St. Catalina Mts., Arizona. July 12–17, 1916, at 8000 ft. elev., [A.N.S.P., no. 6502].

Paratype.—1 ♀; Vernon, British Columbia, July 30, 1923, (D. G. Gillespie), [C.N.C.].

The above paratype varies from the description in that the fore femora have traces of blackish infuscation. The female may be readily separated from that of *basalis* by the stiff spinular development of the humeral setulae, the presutural pair of dorsocentral setulae, and the propleural bristle at base of fore coxa; by the lack of a bristle at middle of anteroventral surface on hind tibia, and by the prominence of parafacials at base of antennae.

Coenosia (Neodexiopsis) simplex (Stein)

Coenosia simplex Stein, Arch. f. Naturgesch., LXXXIV, (1918), A, hft. 9, p. 102, 1920.

The species most closely resembles *N. basalis*, from which it may be separated by the more slender and more tapering third antennal segment; the more protruberant appearance of the parafacials at base of antennae, and by the narrower cheeks. In both sexes the anterior pair of ocellar bristles are scarcely longer than the posterior pair; the abdomen has only a trace of dorsocentral vitta, whereas in *basalis* the abdomen has paired markings in addition to the dorsocentral vitta.

OREGON: 1 ♂, Corvallis, 1902, [Z.M.U.B.]. 1 ♀, Hood River, June 3, 1917, (F. R. Cole), [Ore. Agr. Col.].

Coenosia (Neodexiopsis) basalis (Stein) (Figs. 2, 17, 33)

Dexiopsis basalis Stein, Berl. Ent. Zeitschr., XLII, (1897), p. 259, 1898. Stein, Arch. f. Naturgesch., LXXXIII, (1917), A, hft. 1, p. 155, 1919.

Coenosia basalis Malloch, Trans. Amer. Ent. Soc., XLIV, p. 284, 1918. Huckett, Mem. 101, N. Y. (Cornell) Agr. Exp. Station, (1926), p. 835, 1928.

Neodexiopsis basalis Malloch, Trans. Amer. Ent. Soc., XLVI, p. 162, 1920. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, 236, 1925.

As indicated by Malloch (16), there is a considerable degree of variation in the coloration of tibiae, femora, and abdomen within the species. It may however be readily distinguished from allied species by the long bristle at middle of posterodorsal surface of hind tibia, and, from the female of *pectoralis*, by the presence of a short bristle at middle of anteroventral surface on hind tibia.

GEORGIA: 1 ♀, Atlanta, May 19, 1927, (P. W. Fattig).

ILLINOIS: 2 ♂, 1 ♀, Urbana, April 6, 1909; at sugar, [Ill. N.H.S.].

KANSAS: 1 ♂, Lawrence, April, (E. S. Tucker). 1 ♀, Onaga, May 19, 1901, [all U.S.N.M.].

MISSOURI: 1 ♀, Atherton, May 4, 1916, [H.C.H.].

NEW YORK: 1 ♀, Ithaca, April 15, 1913, (S. W. Frost). 1 ♀, Riverhead, Long Island, Aug. 8, 1926. 1 ♀, Wading River, Long Island, May 17, 1925, [H.C.H.].

OHIO: 1 ♀, Vinton, June 5–12, 1900, (J. S. Hine). 1 ♀, Columbus, April 18, 1903. 1 ♀, Medina, June 1924, [U.S.N.M.].

ONTARIO: 1 ♀, Pt. Pelee, July 22, 1925, (G. S. Walley), [C.N.C.].

PENNSYLVANIA: 2 ♂, "Penn."—, (Aaron), [A.N.S.P.].

Coenosia (Neodexiopsis) rufitibia Stein (Figs. 4, 20, 35)

Coenosia tibialis Stein, Berl. Ent. Zeitschr., XLII, (1897), p. 275, 1898. Smith, Ann. Rept. N. J. State Museum, 1909, p. 793, 1910. Britton, Bull. 31 Conn. Geol. Nat. Hist. Surv., p. 199, 1920.

Coenosia rufitibia Stein, Arch. f. Naturgesch., LXXXIII, (1917), A, hft. 1, p. 161, 1919. Stein, Arch. f. Naturgesch., LXXXIV, (1918), A, hft. 9, pp. 93, 105, 1920. Malloch, Ent. News, XXXII, p. 205, 1921. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 238, 1925. Huckett, Mem. 101, N. Y. (Cornell) Agr. Exp. Station, (1926), p. 836, 1928.

I have removed this species, together with *ovata*, from *Coenosia* on account of the chaetotaxy of hind femora and the structure and appearance of the abdomen, in which they more closely resemble the species in Malloch's genus *Xenocoenosia*. From these, as at present known, they differ in having a bristle at middle of anteroventral surface on hind tibia, and the cephalic pair of ocellar bristles is well developed.

The species *rufitibia* may be readily distinguished from *ovata* by the entire infuscation of all coxae and femora, and by the larger third antennal segment.

CONNECTICUT: 1 ♀, New Haven, Oct. 16, 1903, (H. L. Viereck), [Conn. Agr. Exp. Sta.].

FLORIDA: 1 ♂, St. Petersburg, Feb. 19, 1924; 1 ♀, Feb. 15, 1924, (E. T. Cresson), [all A.N.S.P.]. 1 ♂, Jackson, May 6, 1916. 1 ♀, Palatka, May 3–4, 1916, (J. C. Bradley), [C.U.].

Illinois: 1 ♂, Homer, June 17, 1917, (Homer Park). 1 ♀, Urbana, June 1, 1916, (Forestry), [all Ill. N.H.S.].

Indiana: 1 ♀, Wells County, May 17, 1906, (E. B. Williamson), [U.S.N.M.].

New York: 1 ♂, Riverhead, Long Island, Oct. 23, 1927. 1 ♀, Cold Spring Harbor, Long Island, July 26, 1921. 1 ♀, Lakeville, Long Island, Aug. 14, 1921; 1 ♂, Aug. 13, 1921, [H.C.H.].

Coenosia (Neodexiopsis) ovata Stein (Figs. 5, 18, 34)

Caricea fuscopunctata Slosson not Macquart, Ent. News, vi, p. 320, 1895.

Coenosia ovata Stein, Berl. Ent. Zeitschr., xlii, (1897), p. 263, 1898. Johnson, Bull. Amer. Mus. Nat. Hist., xxxii, p. 78, 1913. Malloch, Trans. Amer. Ent. Soc., xliv, p. 283, 1918. Stein, Arch. f. Naturgesch., lxxxiii, (1917), A, hft. 1, p. 161, 1919. Stein, Arch. f. Naturgesch., lxxxiv, (1918), A, hft. 9, pp. 95, 105, 1920. Malloch, Ent. News, xxxii, pp. 201, 204, 1921. Hallock, Circ. 103, N. J. Dept. Agr., p. 16, 1926. Huckett, Mem. 101, N. Y. (Cornell) Agr. Exp. Station, (1926), p. 835, 1928.

Coenosia fuscopunctata Coquillett (not Macquart), Proc. Wash. Acad. Sci., ii, p. 445, 1900. Smith, Ann. Rept. N. J. State Museum 1909, p. 793, 1910.

This species has been confused with *Coenosia fuscopunctata* Macquart, a species also described from North America, but about which very little is known. The type of Macquart's species is apparently unknown to European workers. I have arbitrarily cited all references to *Coenosia fuscopunctata*, except those in the catalogues of Osten Sacken (30) and Aldrich (1), as relating to *Coenosia ovata*.

There is a considerable degree of variation in the infuscation of coxae, femora, and palpi within the species. In a few specimens the palpi and fore femora are entirely yellow, whilst in others these are mostly blackish infuscated. In a few male specimens the lateral portions of abdominal terga 3 and 4 show traces of the polished chitinous surface, such as is so noticeable in *calopyga*. In other specimens the terga are entirely pollinose. The species is allied to *rufitibia* but differs markedly in that the mid and hind femora are largely yellowish, and the third antennal segment is not abnormal in size. In the male of *ovata* there is a restricted anal extension to the wing membrane, which is lacking in *rufitibia*.

Arizona: 1 ♀, Pinery Canyon, Chiricahua Mts., alt. 6000 ft., Cochise County, July 13, 1919, (Witmer Stone), [A.N.S.P.].

California: 1 ♀, Laws, Nov. 15, 1914.

Connecticut: 1 ♂, Yalesville, Oct. 19, 1903, (H. L. Viereck), [Conn. Agr. Exp. Sta.].

GEORGIA: 1 ♀, Stone Mountain, June 7, 1917. 2 ♀, Tifton, Nov. 1896, (W. M. Wheeler), [Field Museum].

ILLINOIS: 1 ♂, Dubois, May 23, 1917. 1 ♀, Algonquin, Oct. 10, 1895. 1 ♀, Urbana, May 5, 1916, [Ill. N.H.S.].

LOUISIANA: 1 ♀, Opelousas, March 1897, (W. M. Wheeler), [U.S.N.M.].

MISSOURI: 1 ♀, Atherton, May 7, 1916, [H.C.H.].

NEW MEXICO: 1 ♂, Jemez Springs Mts., June, [A.N.S.P.].

NEW YORK: 1 ♂, 2 ♀, Ithaca. 1 ♀, July 4, 1903. 1 ♀, Karner, June 5, 1912. 1 ♀, Albany, May 11, 1916. 1 ♀, Little Neck, Long Island, Aug. 19, 1921. 1 ♂, 1 ♀, Riverhead, Long Island, July 15, 1922; 1 ♂, 3 ♀, Aug. 10, 1927; 1 ♀, Oct. 23, 1927; 3 ♀, Sept. 26, 1927, [H.C.H.].

OHIO: 1 ♀, Cincinnati, June 13, 1902, (J. S. Hine), [Hine].

ONTARIO: 1 ♀, Sudbury, July 11, 1889, [C.N.C.].

PENNSYLVANIA: 1 ♀, Weatherly, May 4, 1913, (H. C. Hallock), [H.C.H.].

SOUTH DAKOTA: 1 ♀, Ardmore, Aug. 13, 1915, (E. G. Holt).

TEXAS: 1 ♀, El Paso, July 23, 1914, (J. C. Bradley), [C.U.].

Coenosia (Neodexiopsis) major (Malloch) (Figs. 3, 19, 32)

Xenocoenosia major Malloch, Trans. Amer. Ent. Soc., XLVI, p. 163, 1920. Malloch, Canad. Ent., LIII, pp. 12, 13, 1921. Frison, Bull. Ill. Nat. Hist. Surv., XVI, p. 209, 1927. Huckett, Mem. 101, N. Y. (Cornell) Agr. Exp. Sta., (1926), p. 836, 1928.

The male of *major* differs from that of *calopyga* in the bristling of the hind femora, and in the pruinescence of the abdomen. In *calopyga* the anteroventral surface of hind femur is beset with a dense series of yellowish bristly hairs, and the abdomen has a pair of highly polished chitinous areas on terga 4 and 5, whereas in *major* the anteroventral surface of hind femur has no such bristly hairs, and the abdomen lacks the polished areas. The male and female of *major* may further be distinguished from those of *calopyga* in that the distal bristle of anteroventral series on hind femur is situated nearly one third the length of femur from apex, whereas in *calopyga* the distal bristle is much nearer the apex.

NEW YORK: 1 ♂, Cold Spring Harbor, Long Island, Sept. 4, 1922; 3 ♂, Sept. 10, 1921; 4 ♀, Sept. 16, 1921. 1 ♀, Riverhead, Long Island, Sept. 12, 1926; 1 ♀, July 11, 1926; 1 ♀, Aug. 10, 1929, [H.C.H.].

NORTH CAROLINA: 1 ♂, Valley of Black Mts., Sept. 19, 1906, (W. Beutenmuller), [A.N.S.P.].

The species has been recorded previously from Florida and New York. I have also seen specimens from Glen Echo, Maryland, collected by Mr. Malloch.

Coenosia (Neodexiopsis) calopyga Loew (Figs. 1, 16, 31)

Coenosia calopyga Loew, Berl. Ent. Zeitschr., XVI, p. 94, 1872. Stein, Ann. Mus. Nat. Hungarici, II, p. 489, 1904. Smith, Ann. Rept. N. J. State Museum, 1909, p. 793, 1910. Stein, Arch. f. Naturgesch., LXXXIII, (1917), A, hft. 1, p. 159, 1919. Stein, Arch. f. Naturgesch., LXXXIV, (1918), A, hft. 9, pp. 94, 103, 1920. Britton, Bull. 31, Conn. Geol. Nat. Hist. Surv., p. 199, 1920. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 237, 1925.

Xenocoenosia calopyga Malloch, Trans. Amer. Ent. Soc., XLVI, p. 162, 1920. Malloch, Canad. Ent., LIII, p. 13, 1921. Huckett, Mem. 101, N. Y. (Cornell) Agr. Exp. Sta., (1926), p. 835, 1928.

The species most closely resembles *floridensis* Malloch, differing essentially in the male sex in that in *calopyga* the third antennal segment is entirely lemon yellow, the fore femur has a distinct series of posteroventral bristles, and the preapical bristle on anteroventral surface of hind femur is clearly differentiated from the dense series of yellowish bristly hairs clothing the same surface, whereas in *floridensis* the third antennal segment is largely infuscated, the posteroventral surface of fore femur is clothed with dense yellowish bristly hairs similar to those found on anteroventral surface of hind femur, and on the hind femur there is no clearly distinguishable preapical bristle on anteroventral surface as in *calopyga*. In both male and female of *calopyga* the apical pair of scutellar bristles is about equal in size to basal pair, whereas in *floridensis* the apical pair of bristles is much weaker than basal pair.

CONNECTICUT: 1 ♀, New Haven, Oct. 21, 1903, (H. L. Viereck), [Conn. Agr. Exp. Sta.].

ILLINOIS: 1 ♀, Savanna, June 14, 1917. 5 ♀, Chicago, July 5, 1899. 1 ♀, Urbana, April 29, 1916, (at window). 1 ♂, Havana, June 5, 1918, (J. R. M.), [all Ill. N.H.S.].

MISSOURI: 1 ♂, Atherton, May, [H.C.H.].

NEW YORK: 1 ♂, 1 ♀, Ithaca. 1 ♀, Poughkeepsie, July 15, 1903, (D. B. Young). 1 ♀, Staten Island, Sept. 19, 1920. 2 ♀, Cold Spring Harbor, Long Island, Sept. 16, 1921. 6 ♂, Riverhead, Long Island, Aug. 10, 1927; 12 ♀, Aug. 10, 1927; 3 ♂, 7 ♀, Oct. 2, 1927; 2 ♂, 2 ♀, Sept. 26, 1927; 5 ♀, Oct. 23, 1927; 1 ♀, Oct. 6, 1926; 1 ♀, Sept. 26, 1927; 1 ♀, Aug. 8, 1926; 2 ♀, June 26, 1927, [H.C.H.].

OHIO: 1 ♀, Hinckley, Medina County, June 26, 1902, [U.S.N.M.].

PENNSYLVANIA: 1 ♂, Lehigh Gap, July 24, 1903. 1 ♂, Dubois, Sept. 3, 1927, [all A.N.S.P.].

VIRGINIA: 1 ♀, Staunton, May 25, 1916, (J. Silver).

Coenosia (Neodexiopsis) floridensis (Malloch)

Xenocoenosia floridensis Malloch, Trans. Amer. Ent. Soc., XLVI, p. 163, 1920. Malloch, Canad. Ent., LIII, p. 13, 1921. Frison, Bull. Ill. Nat. Hist. Surv., XVI, p. 209, 1927. Huckett, Mem. 101, N. Y. (Cornell) Agr. Exp. Station, (1926), p. 836, 1928.

The species has been recorded from Florida and New York. As has already been mentioned, the male resembles that of *calopyga*, but differs in having a dense covering of yellowish bristly hairs on ventral surface of fore femora to the exclusion of the normal series of bristles. In the female the femoral bristling is normal, but in this sex, as in the male, the apical pair of scutellar bristles is shorter than the basal pair, whereas in *calopyga* the apical and basal bristles are about equal in length.

Subgenus **COENOSIA** Meigen

Caricea Robineau-Desvoidy p. p., Essai Myod., p. 530, 1830. Malloch, Ent. News, XXXII, p. 107, 1921.

Coenosia Westwood, Intr. Mod. Class. Ins., Suppl., II, p. 143, 1840.

GENOTYPE: *Musca tigrina* Fabricius.

As has already been mentioned in the discussion concerning the problem of type fixation relating to the genus *Coenosia*, I have concluded that Westwood's designation of *Musca tigrina* Fabricius as type of that genus is valid, and hence the same species may be regarded *ipso facto* as the valid type of the subgenus *Coenosia*. It should be noted however that Westwood (60) after designating *Musca tigrina* as type of *Coenosia* stated that "*Musca tigrina* Fabricius belongs to the subgenus *Caricea*." In this I think he is in error, since the type of the genus should become the type of the subgenus having the generic name.

Rondani in 1866 (36) designated Fabricius' species as the type of *Caricea* on the assumption that *Caricea communis* and *C. vulgaris* are synonyms of *Musca tigrina* Fabricius. Since I have accepted the validity of Westwood's prior designation, I have considered *Caricea* a synonym of *Coenosia* sens. str.

Meade (27) and Strobl (54) on the other hand regarded *communis* as identical with *Anthomyia duplicata* Meigen; Schnabl (41) in 1902 linked the same species up with *Anthomyza anceps* Zetterstedt. In both cases there is a radical departure from the conception of the species as interpreted by Rondani. I can only

explain the wide divergence of opinion regarding the identity of *communis* through apparent failure to realise the full import of certain discrepancies in the literature, concerning which I have dealt at length in the paragraphs discussing the history and status of the genus *Coenosia*.

Stein in 1907 (48) used the genus *Caricea* in the sense of *Lispocephala* Pokorny, in contradiction to his earlier treatment of the group which was largely based on the classification proposed by Rondani. In explanation of such action Stein (50) stated that in reviewing Robineau-Desvoidy's genus he found that he was only able to recognise the species *Caricea erythrocera* with any degree of certainty, which species he forthwith arbitrarily chose as typical of *Caricea*.

Coquillett in 1910 (5) followed Rondani in citing *Musca tigrina* as type of *Caricea*, basing his designation on the supposition that species two to seven of *Caricea* were synonyms of *tigrina*. However Coquillett considered *Caricea* a synonym of *Coenosia*.

In 1911 Schnabl and Dziedzicki (42), despite the former's earlier contentions to the contrary (39) (40) (41), treated *Caricea* in the traditional Rondanian sense, placing it as a subgenus of *Coenosia* sens. lat.

Stein (51) in his later work on the anthomyids of Europe made use of the segregate *Caricea* as a subdivision of *Coenosia*, but both Séguy (43) and Karl (10) suppressed its use in favor of a broader concept of specific relations.

Diagnostic characters.—Hind femur with no preapical bristle on posterior surface; hind tibia with two closely adjacent bristles at middle, situated on anterodorsal and anterior surfaces respectively; fore tibia with a stout mid ventral bristle at apex.

Key to Species of Coenosia

1. Mid and hind femora entirely blackish; hind tibia with a single stout bristle at apex of anteroventral surface; scutellum with no setulae on lateral declivities adjacent the basal pair of bristles..... *humilis* Meigen

   Mid and hind femora broadly yellowish on distal third; hind tibia with a pair of stout bristles at apex of anteroventral surface; scutellum with a few setulae on lateral declivities adjacent the basal pair of bristles..... *tigrina* Fabricius

Coenosia (Coenosia) humilis Meigen (Figs. 10, 23, 40)

Coenosia humilis Meigen, Syst. Beschr., v, p. 220, 1826. Stein, Arch. f. Naturgesch., LXXXIV, (1918), A, hft. 9, p. 93, 1920. Malloch, Ann. Mag. Nat. Hist., (9), x, p. 578, 1922. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 237, 1925. Hallock, Circ. 103, N. J. Dept. Agr., p. 16, 1926. Johnson, Insect Fauna, Biol. Surv. Mt. Desert Region, p. 211, 1927. Johnson, Psyche, XXXVI, p. 143, 1929.

Caricea limpidipennis Robineau-Desvoidy, Essai Myod., p. 533, 1830.

Caricea littoralis Robineau-Desvoidy, Essai Myod., p. 533, 1830.

Anthomyza nana Zetterstedt, Dipt. Scand., IV, p. 1716, 1845.

Anthomyza sexmaculata Zetterstedt, Dipt. Scand., IV, p. 1717, 1845.

Anthomyza humilis Zetterstedt, Dipt. Scand., IV, p. 1732, 1845.

Anthomyia humilis Walker, Ins. Brit., II, p. 140, 1853.

Caricea humilis Schiner, Fauna Austr., I, p. 667, 1862.

Caricea nana Schiner, Fauna Austr., I, p. 667, 1862. Washburn, Bull. 93 Minn. Agr. Exp. Station, p. 125, 1905.

Coenosia nana Strobl, Verh. zool.-bot. Ges. Wien, XLIII, p. 271, 1893.

Coenosia (Caricea) humilis Schnabl, Deutsch. Entom. Zeitschr., Heft 6, p. 62, 1911.

Macrorchis nana Cole and Lovett, Proc. Cal. Acad. Sci., XI, p. 314, 1921.

Schnabl and Dziedzicki (42) cited Zetterstedt's record of *humilis* as evidently a misidentified species, describing the species as *dziedzicki*.

Coenosia humilis is undoubtedly widely distributed throughout North America. The species occurs frequently in greenhouses, and has been recorded by Glasgow as cannabalistic in habit when specimens were confined in a cage.

The species may be distinguished from *tigrina* by the coloring of the mid and hind femora, which are entirely blackish, and by the lack of setulae on lateral declivities of scutellum adjacent the basal pair of bristles.

CALIFORNIA: 1 ♀, Fresno, Oct. 12, 1922, [H.C.H.].

CONNECTICUT: 1 ♀, Cromwell, Oct. 29, 1911, (B. H. Walden), [Conn. Agr Exp. Sta.].

IDAHO: 1 ♂, 1 ♀, Potlatch, Sept. 20, 1919, (A. L. Melander), [A.L.M.].

ILLINOIS: 1 ♀, Urbana, Nov. 13, 1915, (forestry), [Ill. N.H.S.].

INDIANA: 1 ♂, 1 ♀, Muncy, Aug.-Sept. 1907, [U.S.N.M.].

MASSACHUSETTS: 1 ♂, Horse Neck Beach, Aug. 1896, (Hough). 1 ♀, Berlin, March 22, 1897, (J. A. Otterson). 1 ♀, Lawrence, Sept. 25, 1920, [all B.S.N.H.].

NEW JERSEY: 1 ♂, 1 ♀, Riverton, Feb. 6, 1924, (H. C. Hallock), [H.C.H.].

NEW YORK: 1 ♂, Ithaca, March 25, 1916, (S. H. Emerson); 1 ♂, 1 ♀, Aug. 7, 1903; 1 ♂, May 7, 1915. 2 ♂, 1 ♀, Lima, Nov. 6, 1915. 1 ♂, Lancaster,

Aug. 21, 1909. 3 ♂, 2 ♀, Yaphank, Long Island, May 14, 1931, [H.C.H.]. 2 ♂, Cold Spring Harbor, Long Island, July 20, 1927, (A. L. Melander), [A.L.M.].

ONTARIO: 1 ♂, Ottawa, June 18, 1916, (J. L. Beaulne), [C.N.C.].

WASHINGTON: 1 ♂, Colfax, July 4, 1920. 1 ♂, 1 ♀, Olympia, June 22, 1920, [all Wash. State Col.].

Coenosia (Coenosia) tigrina (Fabricius) (Figs. 11, 21, 39)

Musca tigrina Fabricius, System. Entom., p. 779, 1775.
Coenosia tigrina Meigen, Syst. Beschr., II, p. 212, 1826. Huckett, Mem. 101, N. Y. (Cornell) Agr. Exp. Sta., (1926), p. 836, 1928.
?Helina tibialis Robineau-Desvoidy, Essai Myod., p. 494, 1830.
Caricea communis Robineau-Desvoidy, Essai Myod., p. 531, 1830.
Caricea analis Robineau-Desvoidy, Essai Myod., p. 532, 1830.
Caricea paludosa Robineau-Desvoidy, Essai Myod., p. 532, 1830.
Caricea plumosula Robineau-Desvoidy, Essai Myod., p. 532, 1830.
Caricea vittata Robineau-Desvoidy, Essai Myod., p. 532, 1830.
Caricea vulgaris Robineau-Desvoidy, Essai Myod., p. 532, 1830.
Coenosia (Caricea) tigrina Macquart, Hist. Nat. d. Ins., Dipt., II, p. 344, 1835.
Coenosia (Caricea) vulgaris Macquart, Hist. Nat. d. Ins., Dipt., II, p. 344, 1835.
Anthomyza tigrina Zetterstedt, Dipt. Scand., IV, p. 1712, 1845.
Coenosia sexmaculata Walker, List Dipt. Brit. Mus., IV, p. 970, 1849.
Anthomyia tigrina Walker, Ins. Brit., II, p. 132, 1853.
Caricea felina Rondani, Della Soc. Ital. Scienz. Natur., IX, p. 207, 1866.
Caricea tigrina Rondani, Della Soc. Ital. Scienz. Natur., IX, p. 208, 1866. Stein, Zeitschr. f. Hymen. u. Dipt., I, p. 208, 1901. Coquillett, Proc. U. S. Nat. Mus., XXXVII, p. 518, 1910.
Caricea leonina Rondani, Dipt. Ital., Prodr., VI, p. 275, 1877.
Coenosia (Caricea) leonina Strobl. Verh. K. zool.-bot. Ges. Wien, XLIII, p. 273, 1893.

The species was first recorded as occurring in North America by Walker (57), who described it as *Coenosia sexmaculata*. The sole specimen was taken at St. Martin's Falls, Albany River, Hudson Bay, by Mr. G. Barnston. In 1901 Stein (46) drew attention to the synonymy on examination of Walker's specimen at the British Museum. I find that the type specimen exhibits a number of differences from what I consider typical specimens of *tigrina*, chief among which are the lack of spots at base of mesonotal macrochaetae, the absence of marks at basal angles of scutellum, and along the dorsocentral plane of abdomen. All tarsi are yellowish, the fifth segments being brownish.

The species may be readily separated from *humilis* by the orange red color of the femora on distal third, and by the presence

of setulae at base of lateral declivities of scutellum adjacent the basal bristles. In addition, in the male of *tigrina* the processes of fifth sternum bear numerous long bristles which are lacking in *humilis*.

NEW YORK: 4 ♂, 5 ♀, Valley Stream, Long Island, Aug. 6, 1926. 3 ♂, 1 ♀, Calverton, Long Island, Aug. 8, 1927. 1 ♂, 1 ♀, Yaphank, Long Island, June 1, 1920. 1 ♀, Riverhead, Long Island, Aug. 10, 1927, 1 ♀, July 24, 1928, [H.C.H.].

Subgenus **HOPLOGASTER** Rondani

Hoplogaster Rondani, Dipt. Ital., Prodr., I, p. 98, 1856. Coquillett, Proc. U. S. Nat. Mus., XXXVII, p. 580, 1910. Malloch, Bull. Brooklyn Ent. Soc., XII, p. 36, 1917. Malloch, Ent. News, XXXII, p. 107, 1921. Malloch, Ent. News, XXXV, p. 171, 1924. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 238, 1925. Huckett, Mem. 101, N. Y. (Cornell) Agr. Exp. Station, (1926), p. 836, 1928.

Chelisia Meade, Ann. Mag. Nat. Hist., XX, p. 108, 1883.

GENOTYPE: *Musca mollicula* Fallén.

This genus was erected by Rondani in 1856 (35) for the reception of the single species *Musca mollicula* Fallén. In 1866 Rondani (36) added a second nominal species to the genus, namely *H. cincticulus*, which has been regarded by Stein (48) as a synonym of *mollicula*. The genus is considered by Rondani as distinct from *Coenosia* on account of the reduced size of the lower calyptra, which does not protrude in a significant manner beyond margin of upper calyptra, and by the robust development of the processes of fifth abdominal sternum. In 1870 Rondani placed an additional species in the genus, namely *obscuriculus*, which Bezzi has more recently made the type of his monobasic genus *Rhynchocoenops*. In 1893 Pokorny (33) increased the number of species to three by describing *H. alpicolus* from Austria.

Both Meade and Strobl (28) (54) included the species commonly accepted as belonging to *Hoplogaster* with those of *Chelisia* Rondani, a conception which was foreign to Rondani's original generic diagnosis, as later indicated by Pokorny (33). Schiner and Pandellé (38) (31) failed to recognise the segregate as distinct from *Coenosia*. Stein in his earlier writings (45) (48) maintained the group as of generic importance, and in this he was supported by the contributions of Schnabl and Dziedzicki (42), Malloch (15), and Séguy (43). Later, both Stein (51) and

Malloch (25) have doubtfully regarded the genus as distinct from *Coenosia*, whilst Karl (10) has reduced the group to subgeneric rank.

I have followed the procedure of Karl in maintaining the group as of subgeneric significance, although I feel that it is with great difficulty that the group can be kept separate from that of *Limosia*. Intermediate examples of the two groups may well be found in such species as *Limosia johnsoni* and *Hoplogaster nigritarsis*.

Only two European species of *Hoplogaster* have been recognised as occurring in North America, namely *H. molliculus* and *H. octopunctatus* (Zetterstedt). In addition there are the three native species, *H. nigritarsis* Stein, *H. californicus* Malloch, and *H. intactus* (Walker), as well as the records of five new species described herein.

Diagnostic characters.—Hind femur with no preapical bristle on posterior surface; fore tibia with no mid ventral bristle at apex, hind tibia with two closely adjacent bristles at middle; calyptrae subequal, the lower scale sometimes protruding slightly beyond margin of upper as in a few species of *Limosia*, from which they may be distinguished by the presence of a more or less distinct bristle at middle of posterodorsal surface of hind tibia.

Key to Species of Hoplogaster

Males

1. Hind femora and hind tibiae largely black.....2
   Hind femora and hind tibiae largely yellow.....4
2. Fore, mid, and hind femora broadly yellowish on proximal third; fore coxae yellow; longest bristles on posteroventral surface of mid and hind femora not as long as breadth of femur where situated.....*flavibasis* new species
   Fore, mid, and hind femora entirely blackish on proximal third; fore coxae black; longest bristles on posteroventral surface of mid and hind femora longer than breadth of femur where situated.....3
3. Abdomen with paired markings on terga 3, 4, and 5, the spots elongated and narrowly separated; face not flexed forward at oral margin; basal pair of scutellar bristles not strongly developed, about equal in length to caudal pair of dorsocentral bristles; mid femur with a well developed preapical bristle on anterior surface.....*californica* Malloch

Abdomen with no distinct, paired marks on terga, the dorsum with brownish infuscation; face decidedly flexed forward at oral margin; basal pair of scutellar bristles well developed, longer than caudal pair of dorsocentral bristles; mid femur with preapical bristle on anterior surface lacking or weakly developed ..... *nigritella* new species

4. Abdomen blackish, including hypopygium 5
   Abdomen in large part yellow; hypopygium yellow 7
5. Mesonotum with intensive linear marks along the planes of dorsocentral bristles; femora densely infuscated, the fore pair almost entirely, the mid and hind pairs throughout the distal half of dorsal surface; hind tibia with a bristle at middle of posterodorsal surface; mid femur with preapical bristle on anterior and posteroventral surfaces; hind femur with a preapical bristle on posteroventral surface *octopunctata* (Zetterstedt)
   Mesonotum and femora largely unmarked, with traces of markings at most when held in certain lights; hind tibia with no bristle at middle of posterodorsal surface; length, 2–3 mm 6
6. Legs sparsely and weakly bristled, the bristles at middle of tibiae not longer than diameter of tibia; mid tibia with no bristle at middle of anterodorsal surface; hind tibia with no bristle at middle of anteroventral surface; basal pair of scutellar bristles longer than caudal pair of dorsocentral bristles ..... *flavidipalpis* new species
   Legs with normal bristling, the bristles at middle of tibiae longer than diameter of tibia; mid tibia with a bristle at middle of anterodorsal surface; hind tibia with a bristle at middle of anteroventral surface; basal pair of scutellar bristles shorter than caudal pair of dorsocentral bristles *laeta* new species
7. Processes of fifth sternum longer than broad, the sternum cleft to near cephalic margin; posteroventral surface of hind femur with a short apical bristle; mesonotum with dark stripes along the planes of dorsocentral bristles, dorsocentral vitta absent ..... *mollicula* (Fallén)
   Processes of fifth sternum shorter than broad, the sternum with shallow excision caudad to about middle of sclerite; posteroventral surface of hind femur with no apical bristle; mesonotum with at most only a trace of dorsocentral vitta and sublaterals 8
8. Mid and hind femora with two longish bristles on middle third of posteroventral surface; mesonotum with humeral and presutural setulae along cephalic margin normal and setulose in appearance ..... *nigritarsis* Stein

Mid and hind femora with only one longish bristle on middle third of posteroventral surface; mesonotum with stout spinulose setulae on humeral callosities and along the cephalic margin of presutural area; bristles on propleural and notopleural callosities likewise stout and spinulose
intacta (Walker)

Females

1. Tibiae largely black, occasionally the fore pair yellowish....2
   Tibiae yellow, occasionally the hind pair infuscated.....5
2. Humeral callosity with two stout short spines; posterior notopleural bristle likewise short and spinelike; mid femur with a preapical bristle on posteroventral surface; wings broadly infuscated.....*fumipennis* new species
   Humeral callosity with no short spines; posterior notopleural bristle bristlelike; mid femur with no preapical bristle on posteroventral surface; wings clear.....3
3. Abdomen with two brownish spots on terga 3, 4, and 5; mesonotum with three brownish vittae; mid femur with preapical bristle on anterior surface well developed; discal bristles on abdominal terga 4 and 5 well developed.
   californica Malloch
   Abdomen with no distinct spots on terga; mesonotum not trivittate; mid femur with preapical bristle on anterior surface lacking or weakly developed; discal bristles on abdominal terga 4 and 5 weakly developed.....4
4. Tibiae entirely black; mesonotum blackish with seal brown infuscation; eyes hemispherical, higher than broad; abdomen shining, with little trace of pruinescence.
   nigritella new species
   Tibiae more or less yellowish on proximal third; mesonotum grayish pruinescent, with no infuscation; eyes nearly spherical in outline, not much higher than broad; abdomen grayish pruinescent.....*flavibasis* new species
5. All femora largely blackish, shining, the apices yellow; eyes subspherical, nearly as long as high; hind tibia with apical anterodorsal bristle weakly developed, scarcely as long as diameter of tibia where situated...*flavidipalpis* new species
   Mid and hind femora at least broadly yellowish on proximal third, the distal region more or less infuscated or blackened, or entirely yellow as at base; eyes hemispherical, higher than broad; hind tibia with apical anterodorsal bristle at least as long as diameter of tibia where situated.....6
6. Abdomen with large paired markings on terga; mid femur with an apical bristle on posteroventral surface; mid and hind femora blackened on distal half...*octopunctata* (Zetterstedt)

Abdomen with no paired markings on terga; mid femur with no apical bristle on posteroventral surface; mid and hind femora more or less lightly infuscated, or entirely yellow, on distal half 7

7. Abdomen entirely black; mid and hind pairs of coxae and fore femora largely blackish . . . . . *laeta* new species

Abdomen usually largely yellow, if blackish the mid and hind coxae are yellow; fore femur largely yellow, at most with trace of infuscation 8

8. Mid and hind femora with two longish bristles on middle third of posteroventral surface; fore tibia with apical posterodorsal bristle longer than diameter of tibia where situated. *nigritarsis* Stein

Mid and hind femora with only one longish bristle on middle third of posteroventral surface; fore tibia with apical posterodorsal bristle shorter than diameter of tibia where situated . 9

9. Mesonotum with a marginal series of stout spinulose setulae across cephalic margin of presutural area and on humeral callosities; bristles on propleural and notopleural callosities likewise stout and spinulose; mid femur with no anterior preapical bristle; mesonotum not distinctly vittate *intacta* (Walker)

Mesonotum with setulae along cephalic border of presutural area and on humeral callosities normal and setulose in appearance; mid femur with an anterior preapical bristle; mesonotum with two pronounced vittae . . *mollicula* (Fallén)

Coenosia (Hoplogaster) flavibasis new species

Male. Head, thorax, and abdomen entirely blackish, subshining; head, viewed from in front with whitish pruinescence on frons, face, parafacials, and cheeks; the parafacials and cheeks densely pruinescent, with fuscous reflections; the frons lightly whitish pollinose, and the frontal vitta opaque black, when viewed from behind. Antennae blackish, third antennal segment and apex of second segment densely grayish pollinose; palpi blackish.

Thorax lightly whitish pollinose, mesonotum and scutellum, viewed from above, with brownish cinereous infuscation, in which may be seen traces of vittae. Abdomen concolorous with thorax; viewed from above and behind, with three pairs of blackish, patchlike, markings on terga 3, 4, and 5 respectively. Hypopygium with basal sclerite concolorous with abdomen, ninth tergum (anal sclerite) blackish, shining, processes of fifth sternum sparsely pollinose, blackish.

Fore coxae yellowish; mid and hind coxae blackish, yellowish distad; fore, mid, and hind femora yellowish at base, the yellowish

area increasing in extent from hind to fore legs; remainder of femoral surface blackish, except at apex, which is narrowly yellowish; fore, mid, and hind tibiae yellowish at base, and as in the femora, the extent of the yellowish area increases in area successively from hind to fore tibiae; remainder of the tibial surface blackish; tarsi black; pulvilli whitish. Wings clear, veins dark brownish, paler basad; halteres yellowish; calyptrae whitish.

Head when viewed in profile, with parafrontals at base of antennae prominent, projecting beyond a level with oral vibrissae, the length of the head at level with base of antennae greater than that at oral vibrissae; parafacials, at base of antennae, about as wide as width of third antennal segment, narrowed ventrad; cheeks scarcely as high as breadth of third antennal segment, with 2 or 3 weak marginal bristles along ventral border; ventral half of caudal margin of eye noticeably flexed forward, thus restricting the ventral area of eye to narrower proportions than dorsal area, and thus giving the caudal region of head capsule an abnormal appearance. Postorbital series of setulae restricted to dorsal half of head; oral vibrissae stoutly developed; apex of third antennal segment nearly reaching a level with oral margin; third antennal segment about 2.5 times as long as wide; arista minutely pubescent.

Thorax with anterior notopleural bristle stouter developed and noticeably shorter than posterior bristle. Abdomen conical, depressed basad, hypopygium thickened, not large; abdominal bristles weak, setulose; anal segment subglobose, sparsely setulose; fifth sternum broadly incised caudad, the processes short and broad, rounded apicad, with a few weak bristles and setulae along inner border and apical region. Terga 3, 4, and 5 with expansive indefinite, paired marks.

Fore femur sparsely setulose on ventral half of posterior surface; fore tibia with a bristle at middle of posterior surface, and with a weak setulose apical posteroventral bristle; mid femur with one preapical bristle on posterior surface, and with a single bristle on proximal third of posteroventral surface; mid tibia with a strong bristle at middle of anterior surface, and with a shorter bristle at middle of posterior surface, situated at about the same level; hind femur with two bristles on distal half of anteroventral surface, and with one or two weaker bristles on proximal half of posteroventral surface; hind tibia with a bristle at middle of anterodorsal surface, and with no apparent bristle at middle of anteroventral surface; claws and pulvilli short. Wings with *r–m* and *m–cu* cross veins closely approximated, distal section of vein M_{1+2} three to four times as long as the penultimate section. Length, 3 mm.

Female differing essentially from male in having the head more grayish drab; thorax grayish pollinose, with two vittae, each situated along the plane of dorsocentral bristles; abdomen concolorous with thorax, with faint brownish spots on tergum 5; all coxae and femora entirely blackish, except at apices, which are more or less yellowish or reddish; tibiae colored as in male.

Head with third antennal segment shorter than in male, not reaching the oral margin, its length slightly greater than twice width; thorax with anterior notopleural bristle longer than posterior bristle. Bristling of legs as in male, the apical bristles of tibiae stronger; hind femur with 1 or 2 shorter bristles on proximal half of anteroventral surface; hind tibia with a bristle at middle of anteroventral surface, and with a distal series of anterodorsal setulae. Wings with *r–m* and *m–cu* cross veins separated by a distance about equal to one third the length of distal section of vein M_{1+2}.

Length, 3.5 mm.

Type.—♂; Bozeman, Montana. June 23, 1916. (Mont. Exp. Sta.). [U.S.N.M.].

Allotype.—♀; with same data. [U.S.N.M.].

The above species has the dark colored legs of *californica*, but from that species it may be distinguished in the male by having the fore coxae entirely yellow, and the femora broadly yellowish at base, whereas in *californica* the coxae and femora are entirely blackish; in the female, by the lack of a dorsocentral vitta on mesonotum, by the lack of a preapical bristle on anterior surface of mid femur, and by the lack of a distinctive bristle at middle of posterodorsal surface of hind tibia, all of which are present in the female of *californica*.

COLORADO: 1 ♀, Leadville, N. F., 25 miles from Buena Vista, Sept. 1, 1914, (A. K. Fisher), [U.S.N.M.].

MONTANA: 1 ♂, 1 ♀, Bozeman, June 23, 1916, (Mont. Exp. Sta.), (*Type and allotype*), [U.S.N.M.].

Coenosia (Hoplogaster) californica Malloch

Coenosia parvisquama Malloch, Proc. Cal. Acad. Sci., (4), IX, p. 304, 1919.
Hoplogaster californicus Malloch, Trans. Amer. Ent. Soc., XLVI, p. 194, 1920.
Hoplogaster californiensis Malloch, Ent. News, XXXII, p. 205, 1921. Malloch, Ent. News, XXXV, p. 171, 1924.

The above species is larger than either *flavibasis* or *nigritella* which it most closely resembles, in that the tibiae are largely fuscous. Further in *californica* the mid femur has a preapical

bristle on anterior surface, the abdominal bristles are well developed, the hind tibia has a distinctive short bristle at middle of posterodorsal surface, and the mesonotum has a dorsocentral brownish vitta; whereas in *flavibasis* and *nigritella* the mid femur has no preapical bristle on anterior surface, the abdominal bristles are weakly developed, the hind tibia has no distinctive, short, bristle at middle of posterodorsal surface, and the mesonotum has no definite dorsocentral vitta.

New Mexico: 1 ♂, Jemez Mts., Sept. 10, 1914. 1 ♂, 1 ♀, Jemez Springs Mts., June, [all A.N.S.P.].

Coenosia (Hologaster) nigritella new species

Male. Head, thorax, abdomen, and legs, entirely blackish, subshining, except for knees of fore legs, which are narrowly reddish yellow. Parafrontals, parafacials, and cheeks, sparsely whitish pruinescent; frontal vitta, viewed from in front, brownish pruinescent, from above, opaque black. Antennae, viewed from in front, blackish, with a whitish pruinescent spot at apex of second segment; palpi black. Mesonotum, viewed from in front and above, with brownish pruinescence and with traces of brownish vittae. Abdomen bluish black, with brownish dorsocentral infuscation, becoming indistinct cephalad, with no spots; hypopygium blackish, subshining, faintly pollinose; cerci and genital appendages polished; fifth sternum shining along inner border and on apical region. Wings faintly tinged; calyptrae whitish; halteres yellowish; pulvilli tinged.

Head in profile with parafrontals at base of antennae less than width of third antennal segment; cheeks expansive, especially caudad, in the region caudad of eye margin, in height nearly equal to length of third antennal segment, with marginal bristles well developed; third antennal segment slightly less than twice length of second segment; face protruded at oral margin.

Thorax with intraalar bristles weakly developed; posterior notopleural bristle short, erect, noticeably shorter than anterior bristle. Abdomen with bristles weakly developed, thickened caudad; anal segment sparsely setulose; fifth sternum broadly emarginate caudad, the processes short, broad, and truncated at apex, with a few short bristles and setulae along inner border and apical margin.

Fore tibia with a bristle at middle of posterior surface, and with a weak apical posteroventral bristle; mid femur with 1 preapical bristle on posterior surface, with 2 or 3 short bristles on proximal third of anteroventral surface, and with 3 or 4 bristles on proximal half of posteroventral surface, there being a short bristle distad of the longish bristle of series; mid tibia with no

apparent bristle at middle of anterior surface, and with a bristle at middle of posterior surface; hind femur with 3 longer bristles on distal half, and 3 shorter bristles on proximal half of anteroventral surface, posteroventral surface with similar bristles as on mid femur; hind tibia with a bristle at middle of anterodorsal surface, and with no apparent bristle at middle of anteroventral or posterodorsal surfaces. Wings with distal section of vein M_{1+2} about 2.25 times as long as penultimate section. Length, 2.75 mm.

Female similar to male, the mesonotum, scutellum, and abdomen covered with dense brownish infuscation, the abdomen with no apparent markings, except on fifth tergum, which has an indefinite fuscous dorsocentral vitta. Wings more decidedly tinged, margins of calyptrae light brownish, halteres more intensively yellowish. Palpi longish, about equal to length of antennae, apex of third antennal segment reaching to level of oral margin; third antennal segment longer than height of cheek. Mid tibia with a bristle at middle of anterior surface, situated at about the same level as, and longer than posterior bristle; hind tibia with a bristle at middle of anteroventral surface.

Length, 3.5 mm.

Type.—♂; Aneroid Lake, Blue Mts., Oregon, alt. 7500 ft. July 23, 1929. (H. A. Scullen). [H.C.H.].

Allotype.—♀; same data as type. [H.C.H.].

The species differs from either *flavibasis* or *californica* in having the mid and hind tibiae entirely black, the fore tibia being likewise black, except at extreme base, which is reddish yellow, and in having the face markedly flexed forward at oral margin, thus protruding beneath the apex of antennae; whereas in *flavibasis* and *californica* the tibiae are broadly yellowish on proximal third and the face is straight to oral margin, thus not protruding cephalad beneath apex of third antennal segment.

Coenosia (Hoplogaster) octopunctata (Zetterstedt)

Anthomyza octopunctata Zetterstedt, Ins. Lapponica, p. 693, 1840.

Anthomyza strigella Zetterstedt, Ins. Lapponica, p. 695, 1840.

Anthomyza apicalis Zetterstedt, Dipt. Scand., IV, p. 1677, 1845.

Centriocera octopunctata Pokorny, Verh. zool.-bot. Ges. Wien, XLIII, p. 539, 1893.

Coenosia octopunctata Stein, Kat. Paläark. Dipt., III, p. 741, 1907.

Coenosia octomaculata Malloch, Canad. Arct. Exped., 1913–18 III, Pt. C, p. 68c, 1919.

Hoplogaster morrisoni Malloch, Ent. News, XXXV, p. 172, 1924. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 238, 1925.

Malloch has recorded the species from Alaska (17), and from New England (25) under the name *H. morrisoni*. I have with me Swedish specimens of *octopunctata* kindly furnished by Mr. Ringdahl, which agree in every important respect with the above specimens from North America.

The species superficially resembles *Coenosia triseta*, from which it may be distinguished by the smaller size of the lower calyptra. The species belongs to that group in *Hoplogaster* which has the tibiae entirely yellow and the abdomen entirely blackish. It may further be distinguished by the large paired markings on the abdomen, and by the presence of preapical bristles on anterior and posteroventral surfaces of mid femur, and on posteroventral surface of hind femur.

ALBERTA: 1 ♀, Banff, July 23, 1922, (C. B. D. Garrett), [C.N.C.].

QUEBEC: 1 ♀, Harrington Harbor, July 4, 1929. 1 ♀, Natashquan, Aug. 1, 1929. 1 ♀, Net Island, July 12, 1929, (W. J. Brown), [all C.N.C.].

Coenosia (Hoplogaster) flavidipalpis new species

Male with head blackish; parafrontals, parafacials, face, and cheeks sparsely pruinescent; frontal vitta black; antennae black, except for basal region of third antennal segment and apical region of second antennal segment, which are yellowish; palpi yellowish.

Thorax grayish black, sparsely pollinose, subshining, with no trace of vittae, when viewed from above; abdomen concolorous with thorax, viewed from above and behind with trace of paired brownish marks on terga 3, 4, and 5; basal sclerite of hypopygium and fifth sternum concolorous with abdomen; ninth tergum (anal sclerite) blackish. Fore coxae entirely yellow; mid and hind coxae yellowish distad, blackish infuscated basad. Femora, tibiae, and tarsi entirely yellowish, except for apices of fifth tarsal segments, which are brownish tinged; pulvilli white. Wings and calyptrae clear; veins yellowish, paler basad; halteres yellowish.

Eyes separated by a distance slightly greater than length of third antennal segment; head, viewed in profile, with parafacials at base of antennae prominent, protruding slightly beyond level with oral vibrissae; width of parafacials at base of antennae not equal to that of third antennal segment, narrowed ventrad to lineal dimensions. Cheeks slightly higher than width of third antennal segment; ventral half of caudal margin of eye not sharply flexed forward so as to constrict the lower area of eye; oral vibrissae stoutly developed, cheeks with marginal bristles

sparsely distributed but well developed; third antennal segment equal to about twice length of second segment.

Abdomen conical, abdominal bristles weakly developed; marginal bristles on fifth tergum as long as discal bristles; ninth tergum (anal sclerite) sparsely setulose; fifth sternum with processes broad and short, with a few setulae and weak bristles.

Legs slender; fore tibia with no bristle at middle of posterior surface, apical posteroventral bristle setulose; mid femur with 1 or 2 weak bristles on proximal third of anteroventral surface, posteroventral surface with a strong bristle situated at about one third distance from base, and with a shorter bristle basad, posterior surface with a basal bristle and one or two preapical bristles; mid tibia with a short bristle at middle of posterior surface, and with a short apical posteroventral bristle, anterior surface with no middle bristle: hind femur with two stronger, widely spaced bristles on distal half of anteroventral surface, and with 2 weaker, more closely placed bristles basad; posteroventral surface as in mid femur; hind tibia with no bristle at middle of anteroventral surface, and with a bristle at middle of anterodorsal surface, apical posterodorsal bristle equal in size to apical anterodorsal bristle, all three apical bristles on dorsum closely approximated. Tarsi slender. Wings with distal section of vein M_{1+2} 2.5 to 3 times as long as the penultimate section.

Length, 2.25 mm.

Female similar to male, differing essentially as follows: third antennal segment entirely blackish; second antennal segment with a reddish tinge apicad; palpi fuscous black. Abdomen more shining than thorax, the former with no trace of paired markings on tergum 5. All coxae largely blackish, the fore and mid coxae with more or less trace of yellowish apicad. All femora largely black, narrowly yellowish apicad. All tibiae yellow; all tarsi blackish; margins of calyptrae yellowish brown.

Head with cheeks about as high as width of third antennal segment. Fore tibia with a well developed bristle at middle of posterior surface, and at apex of posteroventral surface; mid tibia with a strong bristle at middle of anterior surface, and with a shorter bristle at middle of posterior surface, situated at about the same transverse plane, apical posteroventral bristle stronger developed than in male; hind femur with a series of 4 or 5 widely spaced anteroventral bristles; hind tibia with 1 mid anteroventral, and with 1 mid anterodorsal bristle, apical anterodorsal and posterodorsal bristles short and setulose, situated slightly distad of apical mid dorsal bristle. Distal section of vein M_{1+2} about 2.5 times as long as penultimate section.

Length, 2.75–3 mm.

Type.—♂; Salmon Arm, British Columbia. July 27, 1925. [C.N.C.].

Allotype.—♀; Royal Oak, British Columbia. July 31, 1917. [C.N.C.].

The male of the species resembles *Coenosia pallipes* Stein, from which it may be distinguished by the yellow palpi and by the lack of a spinular process at apex of dorsal (upper) surface of third antennal segment. The female of the species resembles *Coenosia aliena* Malloch, from which it may be distinguished by the closer approximation of apical mid dorsal and anterodorsal bristles on hind tibia, the weaker development of apical anterodorsal bristle on hind tibia which is shorter than diameter of tibia where situated, the smaller size of the lower calyptra, and by the more spherical outline of the eyes.

Within the group, the species may be compared with *H. laeta*, in that in the male the head, thorax, and abdomen are grayish black, the third antennal segment is yellowish basad, the palpi are yellowish, and the femora and tibiae are entirely yellow. In the female the third antennal segment and palpi are entirely blackish. However, in the male of *flavidipalpis* the mid and hind coxae are blackish in large part, and the tibiae are weakly bristled, the mid tibia having no bristle at middle of anterior surface, the hind tibia with no mid anteroventral bristle, and the abdomen with trace of paired markings on terga 3, 4, and 5, whereas in *laeta* the mid and hind coxae are largely yellow, the tibiae have the bristles well developed, the mid tibia having a mid anterior bristle, and the hind tibia a mid anteroventral bristle, and the abdomen has no paired markings on terga 3, 4, and 5. In the female of *flavidipalpis* the fore coxae and mid and hind femora are largely blackish, the abdomen with trace of paired markings and the mesonotum with no trace of vittae; whereas in *laeta* the fore coxae and mid and hind femora are largely yellow, the abdomen with no trace of paired markings and the mesonotum with three vittae.

ALBERTA: 1 ♀, Banff, June 21, 1922, (C. B. D. Garrett), [C.N.C.].

BRITISH COLUMBIA: 1 ♂, Salmon Arm, July 27, 1925, (A. A. Dennys), (*type*). 1 ♀, Royal Oak, July 31, 1917, (W. Downes), (*allotype*), [all C.N.C.].

MONTANA: 1 ♀, Musselshell, Aug. 18, 1917.

Coenosia (Hoplogaster) laeta new species (Figs. 7, 24, 38)

Male grayish black; parafrontals grayish; parafacials, cheeks, and face whitish pruinescent with dark reflections; frontal vitta viewed from in front with whitish pollen, from above blackish with grayish frontal triangle: second antennal segment blackish with yellowish around distal margin; third antennal segment yellowish throughout proximal half, fuscous tinged throughout distal half; palpi yellowish.

Thorax grayish black, with whitish pollen; viewed from above with dark streaks along the planes of dorsocentral bristles. Abdomen grayish black, unmarked, (in certain lights there is a trace of broad fuscous shading along the dorsocentral plane), ninth tergum (anal sclerite) lightly whitish pollinose. Legs with all coxae, femora, and tibiae yellow; all tarsi yellowish except distal segment, which is brownish black. Wings with veins yellowish brown, paler basad; membrane clear; calyptrae whitish; halteres pale yellow.

Head with eyes separated by a distance greater than length of third antennal segment; parafacials at base of antennae, when viewed in profile, not as wide as breadth of third antennal segment; cheeks higher than breadth of third antennal segment; ventral half of caudal margin of eye flexed cephalad, narrowing the ventral area of eye, caudal half of cheeks not noticeably expansive; postorbital setulae continued in a distinct series to ventral region of head; marginal bristles along the ventral border of cheeks short but well developed; third antennal segment fully twice as long as second segment; arista minutely pubescent; anterior pair of ocellar bristles but little longer than posterior pair.

Thorax with humeral setulae spinulose, anterior pair of dorsocentral setulae spinulose; prebasal pair of scutellar bristles much shorter than apical pair, about half as long. Abdominal bristles finely developed, short, longer and stronger laterad; processes of fifth sternum with a few short bristles and setulae, broad and rounded distad, with a restricted apical extension on inner margin.

Fore femur with a series of well developed posteroventral bristles, but the posterodorsal and median posterior series of bristles weak and irregularly developed; fore tibia with a fine bristle at middle of posterior surface, and with a setulose apical posteroventral bristle; mid femur with a longish bristle, and with two weaker bristles on proximal half of posteroventral and anteroventral surfaces respectively; posterior surface with two preapical bristles; mid tibia with one stronger mid anterior bristle, and with one weaker mid posterior bristle, the former situated slightly distad of the latter; apical posteroventral bristle short; hind femur with distal series of bristles widely separated

from proximal series of bristles on anteroventral surface, posteroventral surface as on mid femur; hind tibia with one mid anteroventral, and with one mid anterodorsal bristle, apical mid dorsal bristle situated on a level distinctly basad of apical anterodorsal bristle. Distal section of vein M_{1+2} slightly more than twice as long as penultimate section. Wings with veins M_{1+2} and R_{4+5} slightly diverging distad.

Length, 3 mm.

Female similar to male, the frontal vitta, viewed from in front, with brownish pruinescence; antennae entirely blackish, second segment with a whitish to yellowish pruinescent spot on apical region; palpi blackish fuscous; mesonotum, viewed from above and behind with three brownish vittae, of which the sublaterals are more conspicuous than the dorsocentral vitta. Abdomen unmarked. Fore coxae broadly yellowish, tinged with infuscation proximad; mid and hind coxae successively with less yellowish coloration distad and with increasing infuscation; fore femur with blackish infuscation, except at apical region which is yellowish; mid and hind femora yellowish, with trace of brownish on dorsum of distal half; tibiae entirely yellow; tarsi blackish; pulvilli tinged.

Head with cheeks barely higher than width of third antennal segment; anterior pair of ocellar bristles slightly longer than caudal pair. Fore tibia with one mid posterior, and a well developed bristle at apex of posterodorsal and posteroventral surfaces; mid and hind femora, and hind tibiae, as in male; mid tibia with apical posteroventral bristle well developed. Wings with veins M_{1+2} and R_{4+5} gradually divergent to wing margin as in male.

Length, 3.5 mm.

Type.—♂; Mer Bleue, Ontario. May 28, 1927. (G. S. Walley). [C.N.C.].

Allotype.—♀; Same locality and date. (W. J. Brown.) [C.N.C.].

This species has the abdomen and thorax entirely black as in *flavidipalpis*, which it closely resembles. The male has a superficial resemblance to *Coenosia oregonensis*, but in the male of that species the third antennal segment is entirely yellowish and the abdomen is spotted.

The male of *laeta* may be distinguished from that of *flavidipalpis* in that the mid tibia has a well developed mid anterodorsal bristle, and the hind tibia a mid anteroventral bristle, and the scutellum a short pair of prebasal bristles; whereas in *flavidipalpis*

the mid tibia lacks a mid anterodorsal bristle, and the hind tibia lacks a mid anteroventral bristle, and the prebasal bristles on scutellum are normal in length: in the female of *laeta* the mid and hind femora are largely yellow, and the apical anterodorsal bristle on hind tibia is short, less than diameter of tibia where situated; whereas in *flavidipalpis* the mid and hind femora are largely blackish, and the apical anterodorsal bristle of hind tibia is longer than diameter of tibia where situated. In addition the pair of prebasal bristles on scutellum of *laeta* is much shorter than that of *flavidipalpis*, being about as long as first pair of postsutural dorsocentral bristles.

In the female there is a certain degree of variation in the amount of infuscation on coxae, the hind coxae becoming more or less entirely infuscated or blackened; likewise there may or may not be present a short preapical bristle on anterior surface of mid femur.

Coenosia (Hoplogaster) mollicula (Fallén) (Figs. 9, 25, 36)

Musca mollicula Fallén, Dipt. Suec., Muscides, p. 90, 1825.
Coenosia nemoralis Meigen, Syst. Beschr., v, p. 212, 1826.
?Palusia pallidicornis Robineau-Desvoidy, Essai Myod., p. 544, 1830.
Anthomyza mollicula Zetterstedt, Ins. Lapponica, p. 696, 1840.
Coenosia (*Palusia*) *nemoralis* Westwood, Intr. Mod. Class. Ins., Suppl., II, p. 143, 1840.
Coenosia abdominalis Gimm., Bull. Soc. Imp. Nat. Moscou, XV, p. 683, 1842.
Anthomyia mollicula Walker, Ins. Brit., II, p. 143, 1853.
Coenosia mollicula Schiner, Fauna Austr., I, p. 664, 1862.
Hoplogaster cincticulus Rondani, Dell. Soc. Ital. Scienz. Natur., IX, p. 191, 1866.
Hoplogaster molliculus Rondani, Dell. Soc. Ital. Scienz. Natur., IX, p. 199, 1866. Malloch, Ent. News, XXXV, p. 172, 1924.
Chelisia mollicula Meade, Ent. Month. Mag., XX, p. 108, 1883.
Chelisia biocellata Strobl not Zetterstedt, Verh. zool.-bot. Ges. Wien, XLIII, p. 265, 1893.
Coenosia (*Hoplogaster*) *mollicula* Karl, Tierwelt Deutschlands, XIII, p. 213, 1928.

This European species superficially resembles *nigritarsis* Stein and *intacta* (Walker), in that all three species possess yellowish legs, palpi, third antennal segment, and abdomen. However the species may be readily distinguished structurally. In *intacta* the mesonotum has a series of stout spinular setulae along the cephalic border; in *nigritarsis* the mid and hind femora possess a longish bristle on distal half of posteroventral surface, and in *mollicula* the mid femur has a preapical bristle on anterior

surface. In addition, the male of *mollicula* has the processes of fifth sternum longer than broad, the sternum being cleft deeply to near cephalic margin, whereas in *nigritarsis* and *intacta* the processes are poorly defined, the sternum being broadly emarginate along the caudal margin. In the female of *mollicula* the mesonotum possesses two intensive brownish vittae along the planes of dorsocentral bristles, which are lacking in the females of *nigritarsis* and *intacta*.

ALBERTA: 1 ♂, Waterton, July 19, 1923, (H. L. Seamans), [C.N.C.].

BRITISH COLUMBIA: 1 ♂, Keremeos, June 20, 1923, (C. B. D. Garrett). 1 ♀, Rolls, July 1, 1927, (P. N. Vroom). 1 ♀, Salmon Arm, July 10, 1925, (A. A. Dennys), [all C.N.C.]. 1 ♀, Downie Creek, Selkirk Mts., Aug. 9, 1905, (J. C. Bradley), [C.U.].

MAINE: 2 ♀, E. Eddington, June 25–July 5, (Hough), [U.S.N.M.].

MANITOBA: 1 ♂, Victoria Beach, Aug. 8, 1926, (N. Criddle), [C.N.C.].

MINNESOTA: 1 ♂, 1 ♀, Duluth, St. Louis County, Aug. 6–8, 1912, (Witmer Stone), [A.N.S.P.].

MONTANA: 1 ♀, Gardiner, Aug. 17, 1918. 1 ♀, Jefferson Isl., July 29, 1923, (A. L. Melander), [A.L.M.].

NEW YORK: 2 ♀, Wells, July 27, 1914, (D. B. Young), [H.C.H.].

ONTARIO: 1 ♂, Norway Point, Lake of Bays, Aug. 1, 1919, (J. McDunnough). 1 ♀, Macdiarmid, July 4, 1922. 1 ♀, Low Bush, Lake Abitibi, Aug. 7, 1925, (N. K. Bigelow). 1 ♀, Burke Falls, July 12, 1926, (F. P. Ide). 1 ♀, Lyn, July 7, 1926, (C. H. Curran). 1 ♂, Waubamick, July, 1915, (H. S. Parish). 1 ♂, Conniston, July, 1915, (H. S. Parish). 1 ♀, Brockville, Aug. 5, 1903, (W. Metcalfe), [all C.N.C.].

QUEBEC: 1 ♀, Meach Lake, June 21, 1916. 1 ♀, Chicoulind, July 24, 1915, (G. Beaulieu). 1 ♂, Montreal, July 14, 1906. 1 ♂, Aylmer, Aug. 2, 1924, (C. H. Curran). 1 ♀, Kazubazua, Aug. 18, 1927, (W. J. Brown). 1 ♀, Cottage Beaulieu, Aug. 16, 1916, [all C.N.C.].

SASKATCHEWAN: 1 ♀, Saskatoon, Sept. 5, 1924, (N. J. Atkinson), [C.N.C.].

Coenosia (Hoplogaster) nigritarsis Stein (Figs. 8, 26, 37)

Hoplogaster nigritarsis Stein, Berl. Ent. Zeitschr., (1897), XLII, p. 252, 1898. Williston, Manual N. A. Diptera, p. 335, 1908. Smith, Ann. Rept. N. J. State Museum 1909, p. 792, 1910. Malloch, Ent. News, XXXV, p. 172, 1924. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 238, 1925. Johnson, Insect Fauna, Biol. Surv. Mt. Desert Region, p. 211, 1927. Huckett, Mem. 101 N. Y. (Cornell) Agr. Exp. Station, (1926), p. 836, 1928.

Coenosia nigritarsis Stein, Arch. f. Naturgesch., LXXXIII, (1917), A, hft. 1, p. 161, 1919. Stein, Arch. f. Naturgesch., LXXXIV, (1918), A, hft. 9, pp. 94, 104, 1920.

Stein (45) recorded the species as originally occurring in New York, from specimens sent to him by Hough. I have failed to find these specimens. Much of the Hough collection was de-

posited in the Field Museum at Chicago, and the single male specimen there, which is assumed to be a cotype of *Hoplogaster nigritarsis*, is labelled, Woodbury, N. J., 5.14.93. A similar specimen is to be found in the Stein collection at the Museum of Zoology of the University of Berlin under the name *Coenosia nigritarsis*, which specimen is no doubt the basis of Stein's later record in 1920 (53). I am inclined to believe that these specimens are what Stein had before him when he described *nigritarsis*, and that in error he recorded "N.Y." for "N.J." in his first contribution in 1898 (45).

The species is allied to *mollicula* and *intacta*, but may be distinguished from either by the presence of an additional longish bristle on posteroventral surface of mid and hind femora, situated on distal half.

The species may further be distinguished from *intacta* by the normal development of humeral, first pair of presutural, and propleural setulae, which in *intacta* are spinular in character: from *mollicula*, in the male sex, by the more protuberant development of basal sclerite of hypopygium which bears two pairs of discal bristles, and by the broader and shorter length of processes of fifth abdominal sternum, the basal sclerite in *mollicula* having only a pair of bristles on caudal margin and the fifth sternum being deeply incised; in the female, by the absence of a preapical bristle on anterior surface of mid femur, the absence of an apical bristle on posteroventral surface of hind femur, and by the larger development of the lower calyptra.

MASSACHUSETTS: 1 ♂, 1 ♀, Petersham, July 30, 1926. 1 ♀, June 9, 1932, (A. L. Melander), [all A.L.M.].

MAINE: 1 ♂, 1 ♀, Seal Harbor, July 28, 1930, (A. L. Melander), [A.L.M.].

NEW HAMPSHIRE: 1 ♂, Benton, July 6, 1931. 1 ♂, Pinkham Notch, July 9, 1931. 1 ♂, Lost River, July 7, 1931, (A. L. Melander), [all A.L.M.]. 1 ♀, Center Harbor, Sept. 10, 1914.

NEW JERSEY: 2 ♀, Hemlock Falls, Aug. (A. J. Weidt). 1 ♀, Ballinger's Mill, Aug. 6, 1925, (H. C. Hallock). 3 ♀, Riverton, June 13, 1909. 1 ♀, Iona, Sept. 19, 1909. 1 ♀, Clementon, July 11, 1899, (H.C.H.).

NEW YORK: 3 ♂, 1 ♀, Adirondacks, Avalanche Trail, July 30, 1929. 1 ♂, Fish Creek, Adirondacks, Aug. 2, 1929, (A. L. Melander). 1 ♂, Wells, July 23, 1923, (D. B. Young). 1 ♀, Trenton Falls, June 5, 1921. 1 ♂, Speculator, July 28, 1909; 1 ♀, Aug. 2, 1909, (D. B. Young). 1 ♀, Ringwood, Ithaca, June 26, 1920; 1 ♀, Aug. 16, 1928. 1 ♀, Wild Flower Preserve, Slaterville, Aug. 16, 1928. 1 ♀, Staten Island, July 23, 1921. 1 ♂, 6 ♀, Riverhead,

Long Island, Aug. 8, 1926; 1 ♂, July 29, 1927; 6 ♀, Aug. 10, 1927; 1 ♀, July 3, 1927. 1 ♂, 3 ♀, Syossett, Long Island, July 19, 1921. 1 ♂, 3 ♀, Hempstead, Long Island, July 25, 1921; 12, ♀, June 19, 1921; 2 ♀, Aug. 21, 1921. 1 ♀, Cold Spring Harbor, Long Island, Aug. 20, 1927; 1 ♀, July 26, 1921. 1 ♀, Lakeville, Long Island, May 16, 1921. 2 ♀, Wantagh, Long Island, June 12, 1921. 1 ♀, Yaphank, Long Island, Aug. 8, 1926. 3 ♀, Valley Stream, Long Island, April 27, 1921, [H.C.H.].

NOVA SCOTIA: 1 ♀, West River, Aug. 13, 1913, [C.U.].

ONTARIO: 1 ♂, Orillia, July 15, 1923, (C. H. Curran), [C.N.C.].

QUEBEC: 1 ♂, Burke Falls, July 12, 1926, (F. P. Ide), [C.N.C.].

VERMONT: 1 ♂, Springfield, July 15, 1931, (A. L. Melander), [A.L.M.].

Coenosia (Hoplogaster) intacta Walker

Coenosia intacta Walker, Dipt. Saund., p. 369, 1856. Stein, Zeitschr. f. Hymen. Dipt., I, p. 198, 1901. Stein, Arch. f. Naturgesch., LXXXIII, (1917), A, hft. 1, p. 160, 1919.

Caricea intacta Slosson, Ent. News, VI, p. 6, 1895.

As indicated by Stein (46), there are two specimens in the Walker collection at the British Museum under the name *Coenosia intacta*, both specimens bearing the Walker manuscript label "intacta." The male specimen is *Lispocephala erythrocera* Robineau-Desvoidy, the species described by Walker under the name *intacta* in his paper dealing with characters of undescribed diptera in the collection of W. W. Saunders, published in 1860 (59). The female specimen is a Hoplogaster, and was described by Walker under the name *intacta* in *Diptera Saundersiana* in 1856 (58). The latter species is related to *mollicula* and *nigritarsis*, but may be distinguished from either of them by the spinulose character of the setulae on humeral callosities, of the presutural dorsocentral pair, and of the setulae ventrad of propleural sclerite.

CONNECTICUT: 1 ♀, L. Waramaug, July 23, 1929, (A. L. Melander), [A.L.M.].

MASSACHUSETTS: 1 ♂, 1 ♀, Petersham, July 30, 1926, (A. L. Melander), [A.L.M.].

NEW BRUNSWICK: 1 ♀, Gornish, July 11, 1913, [C.N.C.].

NEW HAMPSHIRE: 1 ♂, Pinkham Notch, July 9, 1931. 2 ♂, Dolly Copp., White Mts., July 13, 1931, (A. L. Melander), [all A.L.M.]. 4 ♀, Center Harbor, Sept. 10, 1914.

NEW YORK: 1 ♀, Ithaca, Aug. 15, 1928, (A. L. Melander). 1 ♂, Conniston, July 1915, (H. S. Parish). 5 ♀, Ringwood, near Ithaca, Aug. 17, 1928; 1 ♀, July 21, 1928, (H. A. Scullen). 1 ♀, McLean Bogs, McLean, Aug. 18, 1928. 1 ♀, N. Fairhaven, July 1, 1921. 1 ♀, Wells, Aug. 3, 1914, (D. B. Young) [H.C.H.].

NOVA SCOTIA: 1 ♀, West River, July 13, 1913, [C.U.].

ONTARIO: 1 ♂, Waubamick, July, 1915, (H. S. Parish). 1 ♀, Brockville, Aug. 5 1903; 1 ♀, Aug. 12, 1903, (W. Metcalfe), [all C.N.C.].

PENNSYLVANIA: 1 ♂, 1 ♀, Dubois, Sept. 3, 1927. 1 ♀, Mineral Spring, Sept. 3, 1927, (A. L. Melander), [A.L.M.].

QUEBEC: 1 ♀, Kazubazua, July 20, 1927, (G. S. Walley), [C.N.C.].

Coenosia (Hoplogaster) fumipennis new species

Female blackish, frontal vitta, viewed from above opaque black, from in front with brownish pruinescence, parafrontals grayish black, with trace of seal brown infuscation adjacent the border of frontal vitta; parafacials, cheeks, and face with whitish pruinescence; antennae entirely black, third antennal segment with grayish pruinescence; palpi blackish; proboscis shining.

Thorax, viewed from above, with scutellum and discal area of mesonotum seal brown infuscated, the humeral and notopleural areas pale gray in contrast, concolorous with pleura. Abdomen subshining, with little trace of pruinescence, with indefinite brownish infuscation on terga 3, 4, and 5.

All coxae blackish. All femora blackened except at extreme apices, which are yellowish; all tibiae fuscous, except at basal third, which are more or less yellowish; tarsi blackish. Wings brownish tinged; calyptrae whitish; halteres yellow.

Eyes separated by a distance slightly greater than length of third antennal segment; cheeks about as high as breadth of third antennal segment; parafacials narrowed to lineal dimensions ventrad; anterior pair of ocellar bristles short, barely longer than posterior pair; third antennal segment about twice as long as second segment; arista short pubescent, hairs about as long as basal diameter of arista; oral vibrissae stoutly developed. Mesonotum with acrosticals very few and sparsely distributed; humeral callosity with two stubby spines; presutural dorsocentral setulae spinulose; posterior notopleural bristle short, about half as long as anterior bristle; anterior intraalar bristle weakly developed. Abdominal bristles short, finely developed.

Fore tibia with a longish bristle at middle of posterior surface; mid femur with a longish bristle at about proximal quarter of anteroventral surface, and with 1 or 2 weaker bristles basad, anterior surface with a preapical bristle, posterior surface with 1 preapical bristle, posteroventral surface with 1 longish bristle at proximal third, and with 1 or 2 weaker bristles basad, also with a preapical bristle; mid tibia with a longer bristle at middle of anterior surface, and with a shorter bristle at middle of posterior surface, both situated at about the same transverse level: hind femur with two bristles on distal third and with one or two bristles on proximal third of anteroventral surface, posteroventral surface as in mid femur: hind tibia with a bristle at middle of anteroventral and anterodorsal surfaces, and with a

short bristle at middle of posterodorsal surface, all bristles situated at about the same transverse level, apical mid dorsal and anterodorsal bristles approximated, situated at about the same transverse plane. Distal section of vein M_{1+2} not twice as long as the section between *r–m* and *m–cu* cross veins.

Length, 3.75 mm.

Type.— ♀ ; Newfield, West Danby, New York. June 1905. (McGillvray). [C.U.].

The female of the species belongs to that group of *Hoplogaster* having the tibiae largely fuscous. It may be readily distinguished from such species by the spinelike development of the setulae on humeral callosity, the abnormally short posterior notopleural bristle, and by the presence of a preapical bristle on posteroventral surface of mid femur. In addition, the wings of the above specimen are noticeably brownish tinged, and the mesonotum and scutellum are covered with a seal brown infuscation.

SCHOENOMYZA Haliday

Ochtiphila Fallén p.p., Dipt. Suec., Ochtidiae, p. 9, 1823.

Schoenomyza Haliday, Entomological Mag., I, p. 166, 1833. Coquillett, Proc. U. S. Nat. Mus., XXXVII, p. 604, 1910. Malloch, Trans. Amer. Ent. Soc., XLIV, p. 288, 1918. Stein, Arch. f. Naturgesch., LXXXIII, (1917), A, hft. 1, p. 156, 1919. Britton, Bull. 31, Conn. Geol. Nat. Hist. Surv., p. 199, 1920. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 239, 1925. Johnson, Insect Fauna, Biol. Surv. Mt. Desert Region, p. 211, 1927. Huckett, Mem. 101, N. Y. (Cornell) Agr. Exp. Station, (1926), p. 836, 1928.

Coenosia Pandellé, Rev. ent. France, XVIII, p. 141, 1899.

The genus *Schoenomyza* was erected by Haliday in 1833 (6) for the reception of two nominal species, both of which were later found to be identical with *Ochtiphila litorella* Fallén. In 1840 Westwood (60) designated *Sciomyza fasciata* Meigen as type of *Schoenomyza*, a species identical with *litorella*. In 1856 Rondani (35) erected the genus *Litorella* with O. *litorella* Fallén as type; and later, in 1866 (36), he recognised the prior claims of *Schoenomyza*, and placed *Litorella* in synonymy. The genus *Schoenomyza* has been recognised by all later students of the group, and, with the exception of Pandellé, the genus has been accorded generic rank. The genus is apparently well represented in South America, Stein (49) giving a key to fifteen neotropical species. In Europe only one species has so far been recognised. In North

America the genus is represented by four species and one variety, namely *S. convexifrons* Malloch, *S. chrysostoma* Loew, *S. dorsalis* Loew, *S. dorsalis sulfuriceps* Malloch, and *S. litorella* (Fallén). I have carefully compared the variety *S. dorsalis partita* Malloch with European specimens of *S. litorella*, and believe the two forms to represent the same species. Stein (45) regarded *dorsalis* as doubtfully distinct from *litorella*.

The Mexican species *Schoenomyza pulicaria* van der Wulp, the type of which I have examined, is a *Hoplogaster*.

In certain respects the North American species *chrysostoma*, *dorsalis*, *litorella*, and *dorsalis sulfuriceps*, might be regarded as variants of the same form. In external structure and chaetotaxy the specimens of all four forms agree closely, according to sex. I have been unable to find any such characters of definite interspecific significance. On the other hand there are certain differences in the pruinescence and coloration of the head in the male, which lend themselves to separating specimens of all four forms into four more or less specific groups. In this I have followed to a large degree the characters given by Malloch (16).

Generic diagnosis.—Frontal vitta broader than long; calyptrae subequal, the lower not conspicuously protruded beyond margin of upper scale; hind basitarsus with a basal spine or thorn on ventral surface; mid tibia with a strong bristle at middle of anteroventral surface.

Key to the Species of Schoenomyza

Males

1. Head with two pairs of parafrontal bristles, as in female; frontal vitta with no trace of whitish pruinescence *convexifrons* Malloch

   Head with one pair of parafrontal bristles; frontal vitta with dense whitish pruinescence 2

2. Viewed from in front, parafrontals and parafacials at base of antennae with deep seal-brown pruinescence; frontal vitta with a broad triangular mark, broadly separating the whitish pruinescence. 3

   Viewed from in front, parafrontals pale, grayish white pruinescent; parafacials at base of antennae yellowish or ochreous; frontal vitta almost entirely with snow white pruinescence on cephalic region, at most with a restricted lanceolate mark along middle 4

3. Knees of all legs conspicuously reddish; face conspicuously blackened throughout dorsal half, the ventral margin defining this area extending across face in a straight line ..... *chrysostoma* Loew

Knees of all legs largely concolorous with femora and tibiae; face usually entirely ochreous or orange in shade, if infuscated on dorsal half the ventral margin defining this area is irregular..... *dorsalis* Loew

4. Frons, viewed from above and in front, with a restricted lanceolate median mark; face lemon yellow, concolorous with cheeks..... *dorsalis sulfuriceps* Malloch

Frontal vitta, viewed from above and in front, entirely whitish pruinescent throughout cephalic half; face orange yellow, deeper tinged than cheeks..... *litorella* (Fallén)

Females

1. Frontal vitta about as long as wide, distance between anterior ocellus and base of antennae about as long as length of antenna; eyes suboval in outline, the anterior margin, when viewed in profile, not extending to the anterior margin of parafacial..... *convexifrons* Malloch

Frontal vitta wider than long, distance between anterior ocellus and base of antennae shorter than length of antenna; eyes subspherical, the anterior margin, when viewed in profile, extending almost to anterior margin of parafacial..2

2. Tibiae decidedly reddish at base; cheeks about as high as width of parafacial at base of antennae, when viewed in profile..... *chrysostoma* Loew

Tibiae, at most, with traces of reddish at base of fore tibiae only..... 3

3. Second antennal segment conspicuously reddish on inner surface; parafacial at base of antennae light seal brown infuscated; eyes widely separated, distance at narrowest, slightly more than one third breadth of head, when viewed from in front..... *dorsalis sulfuriceps* Malloch

Second antennal segment largely blackish on inner surface, with a narrow or inconspicuous reddish border; parafacial at base of antennae intensively seal brown infuscated; eyes separated at narrowest by a distance not exceeding one third breadth of head, when viewed from in front..... 4

4. Frons conspicuously whitish pruinescent throughout cephalic half, when viewed from in front..... *litorella* (Fallén)

Frons not conspicuously whitish throughout cephalic half, when viewed from in front..... *dorsalis* Loew

Schoenomyza convexifrons Malloch (Figs. 13, 29, 45)

Schoenomyza convexifrons Malloch, Trans. Amer. Ent. Soc., XLIV, p. 287, 1918. Frison, Bull. Ill. Nat. Hist. Surv., XVI, p. 208, 1927.

Schoenomyza flaviceps Stein, Arch. f. Naturgesch., LXXXIV, (1918), A, hft. 9, p. 105, 1920.

This species from the Pacific Coast may be readily distinguished from other North American forms by the narrower frons, the less spherical outline of the eyes, and by the greater prominence of parafacials when viewed in profile. The male has no whitish pruinescence on the frons, and possesses two pairs of parafrontal bristles as in female; also the fore coxae are dusted with yellowish pollen.

BRITISH COLUMBIA: 1 ♀, Mill Bay, July 15, 1926. 1 ♀, Cowichon, July 15, 1927, (W. Downes), [all C.N.C.].

CALIFORNIA: 1 ♂, Leland Stanford Jr. University, Lot 72, [U.S.N.M.].

WASHINGTON: 1 ♀, Ilwaco, May 5, 1918, (A. Spuler). 1 ♂, Mukilteo, May 15, 1923, (V. Argo), [H.C.H.].

Schoenomyza chrysostoma Loew (Figs. 15, 30, 44)

Schoenomyza chrysostoma Loew, Berl. Ent. Zeitschr., XIII, p. 177, 1869. Smith, Ann. Rept. N. J. State Museum, 1909, p. 793, 1910. Johnson, Bull. Amer. Mus. Nat. Hist., XXXII, p. 78, 1913. Malloch, Trans. Amer. Ent. Soc., XLIV, No. 782, 288. 1918. Stein, Arch. f. Naturgesch., LXXXIII, (1917), A, hft. 1, p. 156, 1919. Britton, Bull. 31, Conn. Geol. Nat. Hist. Surv., p. 199, 1920. Cole and Lovett, Pro. Cal. Acad. Sci., XI, p. 314, 1921. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 238, 1925. Johnson, Insect Fauna, Biol. Surv. Mt. Desert Region, p. 211, 1927. Huckett, Mem. 101, N. Y. (Cornell) Agr. Exp. Station, (1926), p. 836, 1928.

The male of *chrysostoma* may be readily distinguished from those of other species by the uniformly blackened color of the dorsal half of face and parafacials. The female is not to be so readily distinguished. I have a large series of specimens before me from North Eastern North America and Eastern Canada which no doubt belong to this species but owing to occasional variations the female is difficult to define. The great majority of specimens have all the tibiae conspicuously reddish basad; the hind femur has only one bristle on distal third of anteroventral surface; the hind tibia has two bristles at middle of anteroventral surface and two bristles at middle of anterodorsal surface, of which, in the latter case, the basal bristle may be much weaker

developed than that distad. It is also to be noted that the distance between the distal anterodorsal bristle and the preapical bristles is, in many cases, fully equal to twice the diameter of hind tibia at middle.

I have seen a series of eight male specimens from Beulah, and top of Las Vegas Range, New Mexico, [A.N.S.P.], which has the entire face and parafacials blackened, a variation from the normal form, which has the ventral portion of face and parafacials yellowish.

MINNESOTA: 1 ♂, Duluth, St. Louis County, Aug. 6–8, 1912, (Witmer Stone), [A.N.S.P.].

NEW BRUNSWICK: 1 ♂, 1 ♀, Bayberd, June 25, 1914, (J. D. Tothill), [C.N.C.].

NEW JERSEY: 2 ♂, Trenton, July 4, 1914; 1 ♂, Aug. 1, 1910, [H.C.H.].

NEW YORK: 1 ♂, Mud Creek, Tompkins County, June 17–20, 1904. 1 ♂, Speculator, Aug. 6, 1912; 1 ♀, Aug. 5, 1912, (D. B. Young). 11 ♂, 15 ♀, Wells, July 19, 1913, (D. B. Young). 1 ♂, McLean, July 2–3, 1904; 1 ♂, May 29, 1915. 1 ♂, Varna, near Ithaca, July 26, 1921. 1 ♀, Maclean Bogs, Tompkins County, May 30, 1914. 1 ♀, Ringwood, near Ithaca, June 26, 1920. 1 ♀, Ithaca, June 9, 1920; 2 ♀, May 20, 1913; 2 ♀, May 16, 1900. 1 ♀, Michigan Swamp, Tompkins County, July 23, 1920. 1 ♀, Chipmunk Swamp, Vandalla, June 8–10, 1915, [H.C.H.].

NOVA SCOTIA: 1 ♀, Truro, Sept. 15, 1913, (R. Matheson), [C.U.].

ONTARIO: 1 ♀, Kettliby, May 17, 1925. 1 ♀, Sanford, June 1906. 2 ♀, Port Hope, May 5, 1925. 1 ♀, Macdiarmid, Lake Nipigon, July 26, 1922. 1 ♀, Black Rock, Aug. 25, 1913. 1 ♂, Waubamick, June 1915, (H. S. Parish), [all C.N.C.].

QUEBEC: 1 ♀, Woburn, June 19, 1923, (C. H. Curran), [C.N.C.].

WASHINGTON: 3 ♀, Ilwaco, June 6, 1918, (A. Spuler), [Wash. State Col.].

Schoenomyza dorsalis Loew (Figs. 12, 27, 42)

Schoenomyza dorsalis Loew, Berl. Ent. Zeitschr., XVI, p. 95, 1872. Smith, Ann. Rept. N. J. State Museum 1909, p. 793, 1910. Johnson, Bull. Amer. Mus. Nat. Hist., XXXII, p. 78, 1913. Malloch, Trans. Amer. Ent. Soc., XLIV, p. 288, 1918. Stein, Arch. f. Naturgesch., LXXXIII, (1917), A, hft. 1, p. 156, 1919. Britton, Bull. 31, Conn. Geol. Nat. Hist. Surv., p. 199, 1920. Cole and Lovett, Proc. Cal. Acad. Sci., XI, p. 314, 1921. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 238, 1925. Johnson, Biol. Surv. Mt. Desert Region, p. 211, 1927. Huckett, Mem. 101, N. Y. (Cornell) Agr. Exp. Station, (1926), p. 836, 1928.

The male of *dorsalis* may be distinguished from that of *sulfuriceps* or *litorella* by the retention of a broad median V-shaped

mark on frontal vitta, when viewed from in front. This mark nearly reaches the base of antennae. In the female of *dorsalis* the cephalic half of frontal vitta is less conspicuously whitish than in the female of *litorella*, and the second antennal segment less conspicuously reddish than in the case of *sulfuriceps*.

ALBERTA: 1 ♂, 1 ♀, Lethbridge, May 20, 1923. 1 ♂, Banff, June 2, 1922, (C. B. D. Garrett), [all C.N.C.].

ARIZONA: 1 ♂, Pinery Canyon, Chiricabua Mts., Cochise County, July 12, 1919, 6000 ft. alt. (Witmer Stone), [A.N.S.P.].

BRITISH COLUMBIA: 1 ♂, 1 ♀, Salmon Arm, Aug. 1, 1925. 1 ♀, St. Marys, July 12, 1916, (A. A. Dennys). 1 ♀, Agassiz, June 1, 1926, (R. Glendenning), [all C.N.C.]. 1 ♂, 2 ♀, Carbonate to Prairie Hills, July 12–18, 1908, (J. C. Bradley), [C.U.].

CALIFORNIA: 1 ♂, Castle Lake, Shasta Range, Aug. 28, 1916, (A. Kusche). 1 ♂, 1 ♀, Echo Lake, Shasta Range, Aug. 29, 1916, (A. Kusche), [all A.N.S.P.].

COLORADO: 1 ♀, Eldora, Sept. 19 (T. D. A. Cockerell), [U.S.N.M.].

ILLINOIS: 1 ♂, Meredosia, May 28, 1917. 1 ♂, Urbana, June 9, 1916. 1 ♀, Algonquin, April 6, 1894, [all Ill. N.H.S.].

IOWA: 1 ♂, 1 ♀, Ames, Apr. 22, 1928; 1 ♀, Apr. 26, 1927. 1 ♂, 1 ♀, Britt, May 19, 1928, (G. S. Hendrickson). 2 ♀, Ames, Apr. 22, 1928, (G. S. Walley), [H.C.H.].

MANITOBA: 1 ♂, 1 ♀, Aweme, May 30, 1924; 1 ♀, May 5, 1925, (N. Criddle), [C.N.C.].

MISSOURI: 1 ♂, 1 ♀, Columbia, May 26–June 8, 1906, (C. R. Crosby), [H.C.H.].

MONTANA: 1 ♂, Bozeman, July 6, 1916, [Mont. Agr. Exp. Sta.]. 1 ♀, Piedmont, Aug. 8, 1913. 1 ♀, Warm Springs, June 13, 1916. 2 ♂, Roosevelt Station, Yellowstone Park, July 5, 1923. 1 ♂, Lewis Falls, Yellowstone Park, July 17, 1923, (A. L. Melander), [all A.L.M.].

NEW MEXICO: 1 ♂, Top of range, Las Vegas, June 28, 1902. 1 ♀, Beulah, top of range, June 28, 1902, [all A.N.S.P.].

NEW YORK: 1 ♂, 1 ♀, Ithaca, June 9, 1920; 1 ♂, July 18, 1907. 1 ♂, Mud Creek, Tompkins County, June 17–20, 1904. 2 ♂, Chipmunk Swamps, Vandalla, June 8–10, 1915. 1 ♀, Riverhead, Long Island, Sept. 17, 1913; 1 ♀, Sept. 26, 1927. 1 ♀, Wells, July 19, 1913, (D. B. Young). 1 ♀, Michigan Swamp, Tompkins County, July 23, 1926, [H.C.H.].

ONTARIO: 1 ♀, Miners' Bay, May 26, 1927, (F. P. Ide). 1 ♀, Port Hope, May 25, 1925, (G. S. Walley), [C.N.C.].

PENNSYLVANIA: 1 ♂, Lansdale, July 3, 1910, (E. T. Cresson Jr.), [A.N.S.P.].

WASHINGTON: 1 ♂, Pullman, May 3, 1924, (A. L. Melander). 1 ♀, Coulee City, Sept. 3, 1920, (R. C. Shannon). 1 ♀, Ilwaco, May 16, 1918, (A. Spuler), [H.C.H.].

Schoenomyza dorsalis sulfuriceps Malloch

Schoenomyza dorsalis sulfuriceps Malloch, Trans. Amer. Ent. Soc., XLIV, p. 288, 1918. Frison, Bull. Ill. Nat. Hist. Surv., XVI, p. 208, 1927.

The male of *sulfuriceps* differs from that of the typical *dorsalis* and of *litorella* in that the face is typically pale yellow, concolorous with cheeks; the third antennal segment is conspicuously silvery pruinescent and possesses a reddish tinge to a marked degree, the fuscous area being restricted to lower ventral surface; the frontal vitta, when viewed from above and in front, has a narrow, lanceolate, ill defined marking dividing the whitish pruinescence into two equal halves. In *dorsalis* and *litorella* the face has typically a reddish orange hue, which is deeper colored than the cheeks, and the third antennal segment is more opaque, the fuscous area extending throughout the greater part of lateral aspect.

In the female the differences are more obscure. However, in viewing the head from in front, it is to be noted that the eyes of *sulfuriceps* are relatively more widely separated than those of *dorsalis* and *litorella*, the measurement being made at narrowest distance of separation. In *sulfuriceps* the second antennal segment is conspicuously reddish on inner surface, and the infuscation on parafacials at base of antennae is pale, whereas in *dorsalis* and *litorella* the second antennal segment is largely blackish on inner surface, with a restricted reddish distal margin, and the infuscation on parafacials at base of antennae is more intensive.

ALBERTA: 1 ♂, Banff, Sept. 16, 1922, [C.N.C.].

BRITISH COLUMBIA: 1 ♂, 1 ♀, Oliver, Apr. 12, 1923, (C. B. D. Garrett). 1 ♂, Crows Nest, July 26, 1916. 1 ♀, Cranbrook, May 12, 1926, (A. A. Dennys). 1 ♂, 1 ♀, Minnie Lake, July 27, 1925, (H. G. Crawford), [all C.N.C.].

CALIFORNIA: 1 ♂, 1 ♀, Cloverdale, (J. C. Bradley). 1 ♂, Stanford U., Dec. 29, 1897. 1 ♀, San Joaquin Ranch, near Fresno, Oct. 20, 1922. 1 ♂, 1 ♀, Palm Canon, Palm Springs, Dec. 17, 1917, (J. C. Bradley). 1 ♂, 1 ♀, Siberian Outpost, Tulare County, July 31, 1915, 9500–10500 ft. elev. 1 ♂, 2 ♀, Crabtree Meadow, Tulare County, July 23, 1915, 10550 ft. elev. 1 ♂, Rattlesnake Creek, Tulare County, Aug. 2, 1915, 9000 ft. elev., [all C.U.]. 1 ♂, High Sierras, Inyo County, Sept. 6, 1919, 10700 ft. elev., (R. & H.). 1 ♀, Cahoon Meadow, Giant Forest, Aug. 5, 1915, 7000–8000 ft. elev. 1 ♂, Berkeley Hills, Alameda County, March 14, 1908; 1 ♀, Nov. 19, 1908, (E. T. Cresson Jr.), [A.N.S.P.].

COLORADO: 1 ♂, 1 ♀, Grand Lake, Sept., 1916, (T. D. A. Cockerell), [U.S.N.M.]. 1 ♀, John Smith Range Station, Cochetopa, N. F., July 3, 1913, (A. K. Fisher), [A.N.S.P.].

IDAHO: 1 ♂, Moscow Mt., June, 1917, (A. L. Melander), [U.S.N.M.].

MONTANA: 1 ♂, 1 ♀, Yellowstone Park, July 24, 1916, 7250 elev. 1 ♂, Bozeman, Aug. 3, 1916, 1 ♂, July 27, 1916. 1 ♂, Piedmont, Aug. 8, 1913. 1 ♀, Dillon, Aug. 5, 1908. 1 ♀, Arlee, June 1, 1915, [Mont. Agr. Exp. Sta.].

NEVADA: 1 ♀, Lee Canyon, Spring Mountain, Aug. 19, 1919, 8000–8500 ft. elev.

OREGON: 1 ♂, 1 ♀, Anthony Lake, Blue Mts., 7100 ft. elev., Aug. 3, 1929. 1 ♂, 1 ♀, Horseshoe Lake, Blue Mts., 7500 ft. elev., July 25, 1929, (B. A. Scullen), [Ore. Agr. Col.].

WASHINGTON: 2 ♂, Lind, June 5, 1919, (F. W. Carlson). 2 ♂, Pullman, Aug. 10, 1910; 1 ♀, Aug. 16, 1910, (V. Argo). 1 ♂, Mt. Baker, Skyline trail, Aug. 10, 1925. 1 ♂, 1 ♀, Asotin, Apr. 15, 1923, (V. Argo), [all Wash. State Col.]. 1 ♂, 1 ♀, Coulee City, Sept. 3, 1920. 1 ♂, 1 ♀, Lake Paha, July 20, 1920. 1 ♀, Ritzville, Aug. 25, 1920, (R. C. Shannon), [all H.C.H.].

Schoenomyza litorella (Fallén) (Figs. 14, 28, 43)

Ochtiphila litorella Fallén, Dipt. Suec., Ochtidiae, p. 10, 1823.
Coenosia punctum Meigen, Syst. Beschr., v, p. 217, 1826.
Sciomyza defecta Meigen, Syst. Beschr., vi, p. 19, 1830.
Sciomyza fasciata Meigen, Syst. Beschr., vi, p. 19, 1830.
Sciomyza albiceps Meigen, Syst. Beschr., vi, p. 20, 1830.
Schoenomyza litorella Haliday, Entomological Mag., i, p. 149, 1833. Stein, Arch. f. Naturgesch., LXXXIV, (1918) A, hft. 9, p. 106, 1920. Johnson, Occ. Pap. Boston Soc. Nat. Hist., vii, p. 239, 1925. Johnson, Insect Fauna, Biol. Surv. Mt. Desert Region, p. 211, 1927. Huckett, Mem. 101, N. Y. (Cornell) Agr. Exp. Station, (1926), p. 836, 1928.
Sciomyza acuticornis Meigen, Syst. Beschr., vii, p. 363, 1838.
Litorella ochtiphilina Rondani, Dipt. Ital., Prodr., i, p. 101, 1856.
Coenosia litorella Rondani, Dipt. Ital., Prodr., vi, p. 240, 1877.
Coenosia (*Schoenomyza*) litorella Pandellé, Rev. ent. France, xviii, p. 141, 1899.
Schoenomyza dorsalis partita Malloch, Trans. Amer. Ent. Soc., xliv, p. 289, 1918. Frison, Bull. Ill. Nat. Hist. Surv., xvi, p. 208, 1927.

The species closely resembles *dorsalis*, differing essentially in that in *litorella* the cephalic half of frontal vitta is entirely whitish pruinescent when viewed from in front, whereas in *dorsalis* the whitish pruinescence is deeply divided by a broad V-shaped mark. In the female of *litorella* the frontal vitta is likewise conspicuously whitish, though less densely so than in the male, whereas in *dorsalis* the cephalic half of frontal vitta is not noticeably whitish.

BRITISH COLUMBIA: 1 ♀, Vernon, July 14, 1926, (D. G. Gillespie), [C.N.C.].

CALIFORNIA: 1 ♂, Palo Alto, Aug. 3, 1894. 1 ♂, Felton, St. Cruz Mts., May 15–19, 1907, 300–500 ft. alt., (J. C. Bradley), [C.U.].

Colorado: 1 ♀, Buena Vista, Aug. 31, 1914, (A. K. Fisher), [A.N.S.P.]. 1 ♀, Grand Lake, Sept., 1926, (T. D. A. Cockerell), [U.S.N.M.].

Montana: 1 ♀, Gallatin County, Aug. 27, 1913, 4800 ft. alt. 1 ♀, Bozeman, June 19, 1906, [H.C.H.].

New Mexico: 1 ♂, Beulah, top of range, June 28, 1902. 1 ♂, Top of Las Vegas Range, June 28, 1902. 1 ♂, Cloudcroft, June 16, 1902, [all A.N.S.P.].

Oregon: 1 ♂, 1 ♀, Corvallis, June 29, 1925, (J. Wilcox), [Ore. Agr. Col.].

Saskatchewan: 1 ♂, Ogema, June 17, 1916, (N. Criddle), [C.N.C.].

Washington: 1 ♂, 1 ♀, Ilwaco, May 16, 1918; 1 ♂, June 6, 1918, (A. Spuler). 1 ♂, Asotin, Apr. 22, 1923. 1 ♂, Mt. Vernon, July 3, 1924, [all Wash. State Col.].

Additional Species

Coenosia fuscopunctata Macquart

Coenosia fuscopunctata Macquart, Dipt. Exot., Suppl. iv, (1849), p. 270, 1850.

The species was described from North America from a female in the collection of Mr. Hoffmeister of Nordshausen, and is listed in the catalogues of Osten Sacken (30), Aldrich (1), and Stein (52). Coquillett determined specimens from Florida (7), New Hampshire (44), and Alaska (3) as this species, citing in the last instance the synonymy of *Coenosia ovata* Stein. Later it is evident that Coquillett (8) considered the two species as distinct, preferring to recognise the species that he had named formerly *fuscopunctata* as *Coenosia ovata.* I have failed to trace the existence of the type, and, although the description might be that of a female *ovata*, I hesitate to recognise the two species as identical.

Coenosia solita Walker

Coenosia solita Walker, Insect. Saund., Dipt., p. 368, 1856. Johnson, Bull. Amer. Mus. Nat. Hist., xxxii, p. 78, 1913. Stein, Arch. f. Naturgesch., lxxxiii, (1917), A, hft. 1, p. 162, 1919. Johnson, Occ. Pap. Boston Soc. Nat. Hist., vii, p. 238, 1925. Huckett, Mem. 101, N. Y. (Cornell) Agr. Exp. Station, (1926), p. 836, 1928.

Caricea solita Slosson, Ent. News, vi, p. 6, 1895.

The species was described from the United States from a female in the collection of Mr. Saunders. I have seen specimens with this name which were identical with *atrata*, *lata*, and *nigrescens*. Unfortunately the type of *Coenosia solita* is evidently missing from the Walker collection in the British Museum, hence I am unable to recognise the species.

Coenosia albicornis Meigen

Coenosia albicornis Meigen, Syst. Beschr., v, p. 220, 1826.
Caricea albicornis Slosson, Ent. News, vi, p. 6, 1895. Britton, Bull. 31, Conn. Geol. Nat. Hist. Surv., p. 199, 1920. Johnson, Occ. Pap. Boston Soc. Nat. Hist., vii, p. 238, 1925.

The species has been recorded from North America from specimens determined by Coquillett (44). I have been unable to find these specimens in the Slosson collection at the American Museum of Natural History, New York, and hence am unable to verify the record. According to Stein (48) the species is not valid, the female being identical with that of *Anthomyza tricolor* Zetterstedt, and the male with that of *Musca pumila* Fallén. Neither of these species, so far as I know, has been recorded from North America.

Coenosia laricata Malloch

Coenosia laricata Malloch, Trans. Amer. Ent. Soc., xlvi, p. 166, 1920. Malloch, Ent. News, xxxii, p. 203, 1921. Frison, Bull. Ill. Nat. Hist. Surv., xvi, p. 198, 1927.

The species was described from Illinois from a female in the collection of the Illinois Natural History Survey. Without the specimen I am unable to place it in the key and to discuss its interrelations. However the female is peculiar in having the bristles at base of propleura short and spinular, as in *Hoplogaster intactus*. The legs are short and stoutly developed, and the hind tibia has two or three setulose bristles on posterodorsal surface.

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Leiden, and of Stein's types in the Zoological Museum of the University of Berlin [Z.M.U.B.].

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I have had considerable difficulty in coming to a decision regarding the valid type of the genus *Coenosia*. In this problem of nomenclature I have had the generous advice of Dr. J. C. Bradley of Cornell University, who very kindly dealt exhaustively with the case in hand. I also wish to acknowledge the advice and suggestions concerning the same problem communicated to me by Mr. J. E. Collin, Mr. E. T. Cresson, Jr., and Dr. J. Villeneuve.

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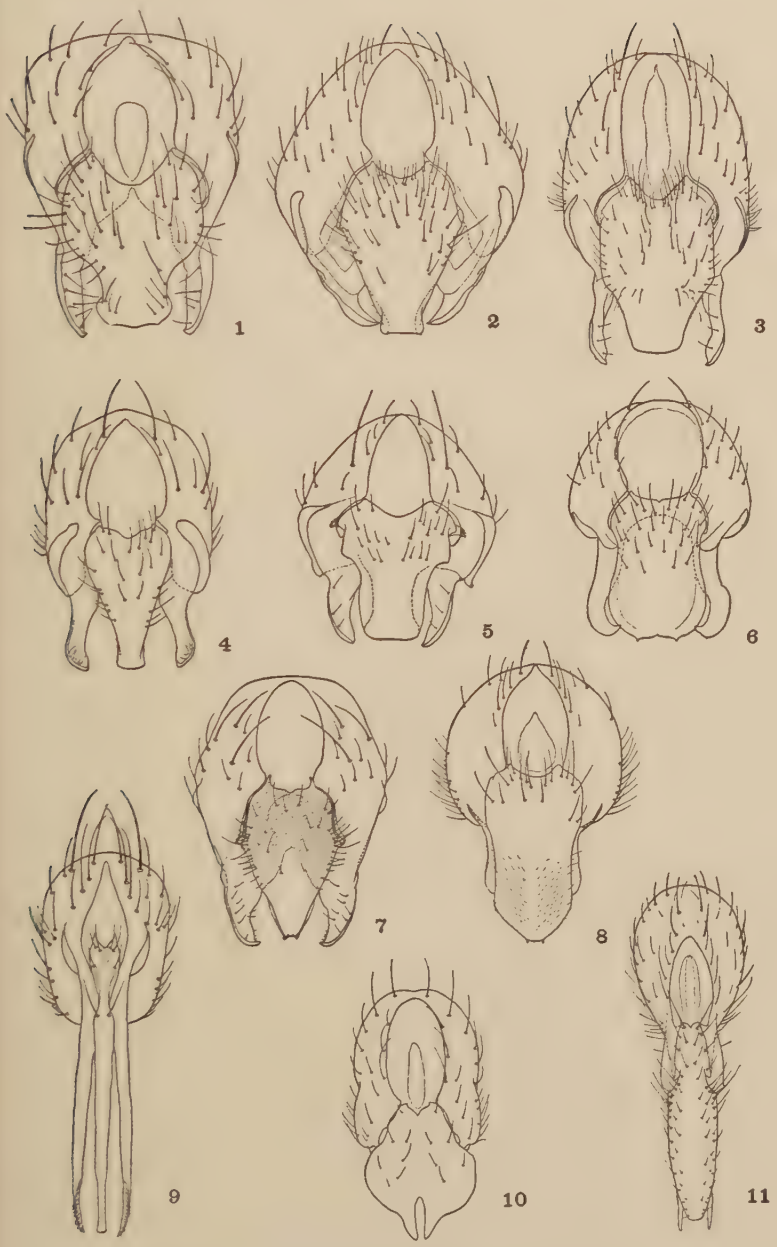
EXPLANATION OF PLATES

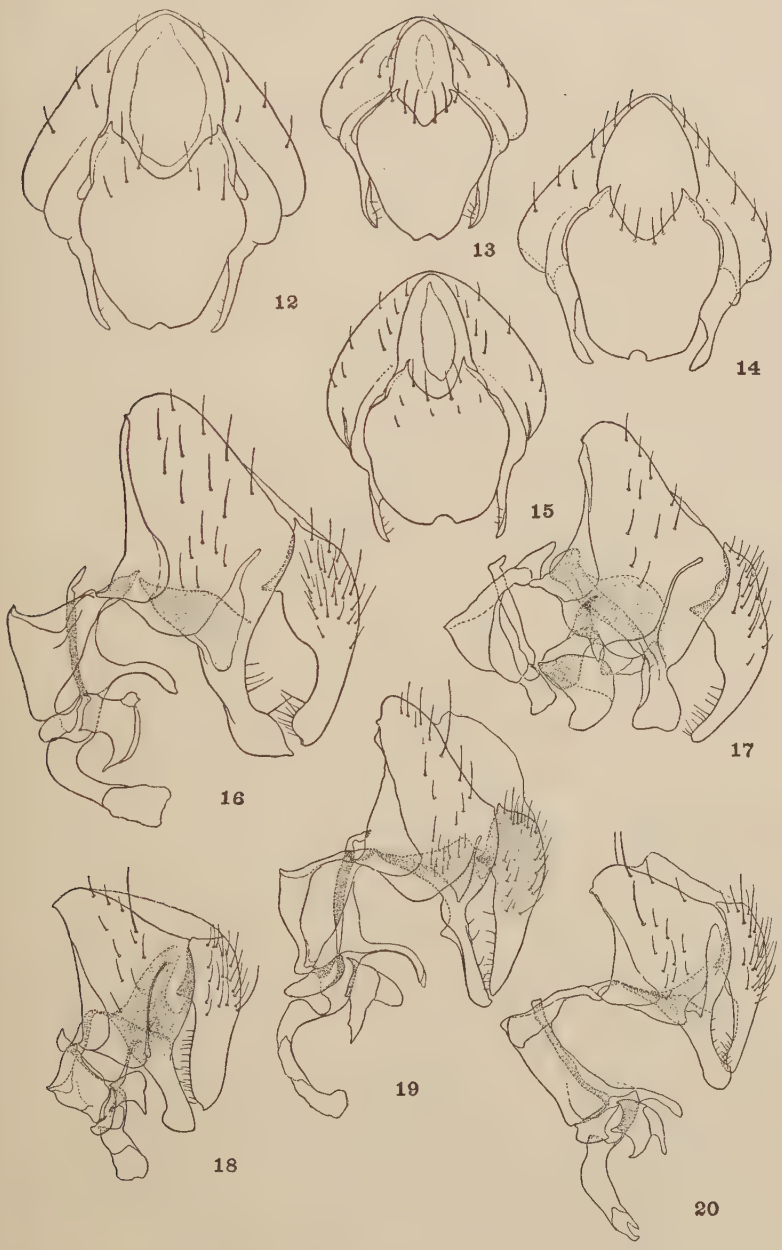
PLATE IV

Dorsal or caudal aspect of male copulatory appendages

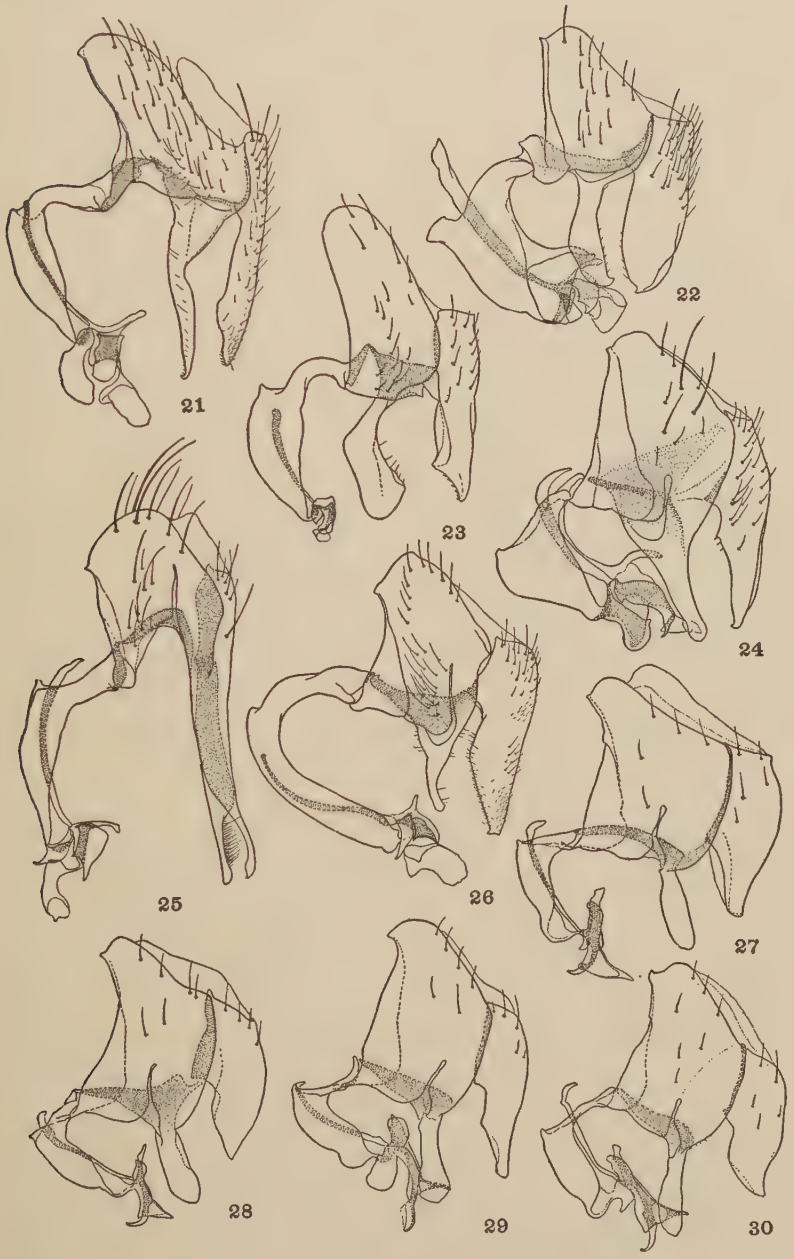
Fig. 1.—*Coenosia* (*Neodexiopsis*) *calopyga* Loew
Fig. 2.—*Coenosia* (*Neodexiopsis*) *basalis* (Stein)
Fig. 3.—*Coenosia* (*Neodexiopsis*) *major* (Malloch)
Fig. 4.—*Coenosia* (*Neodexiopsis*) *rufitibia* Stein
Fig. 5.—*Coenosia* (*Neodexiopsis*) *ovata* Stein
Fig. 6.—*Bithoracochaeta leucoprocta* (Wiedemann)
Fig. 7.—*Coenosia* (*Hoplogaster*) *laeta* new species
Fig. 8.—*Coenosia* (*Hoplogaster*) *nigritarsis* (Stein)
Fig. 9.—*Coenosia* (*Hoplogaster*) *mollicula* (Fallén)
Fig. 10.—*Coenosia* (*Coenosia*) *humilis* Meigen
Fig. 11.—*Coenosia* (*Coenosia*) *tigrina* (Fabricius)



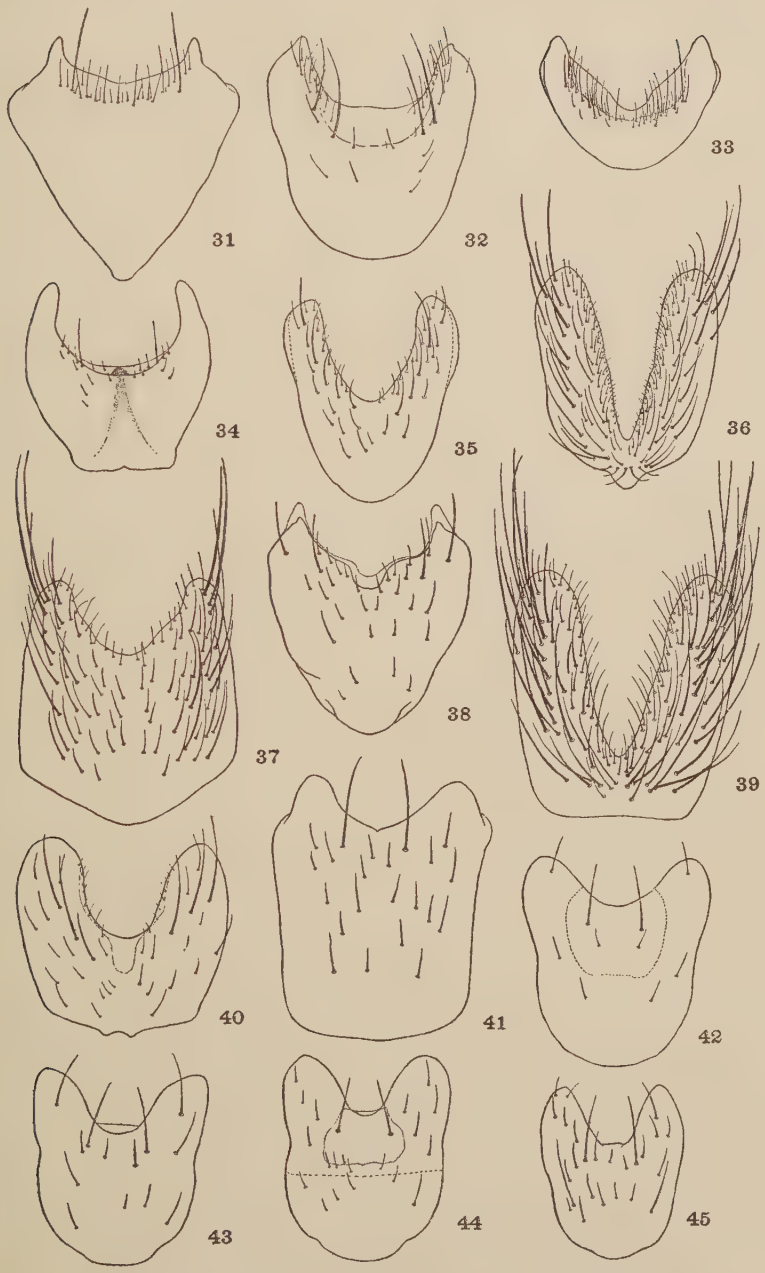
HUCKETT—NORTH AMERICAN COENOSIA



HUCKETT—NORTH AMERICAN COENOSIA



HUCKETT—NORTH AMERICAN COENOSIA



HUCKETT—NORTH AMERICAN COENOSIA

Plate V

Dorsal or caudal aspect of male copulatory appendages

Fig. 12.—*Schoenomyza dorsalis* Loew
Fig. 13.—*Schoenomyza convexifrons* Malloch
Fig. 14.—*Schoenomyza litorella* (Fallén)
Fig. 15.—*Schoenomyza chrysostoma* Loew

Lateral aspect of male copulatory appendages

Fig. 16.—*Coenosia* (*Neodexiopsis*) *calopyga* Loew
Fig. 17.—*Coenosia* (*Neodexiopsis*) *basalis* (Stein)
Fig. 18.—*Coenosia* (*Neodexiopsis*) *ovata* Stein
Fig. 19.—*Coenosia* (*Neodexiopsis*) *major* (Malloch)
Fig. 20.—*Coenosia* (*Neodexiopsis*) *rufitibia* Stein

Plate VI

Lateral aspect of male copulatory appendages

Fig. 21.—*Coenosia* (*Coenosia*) *tigrina* (Fabricius)
Fig. 22.—*Bithoracochaeta leucoprocta* (Wiedemann)
Fig. 23.—*Coenosia* (*Coenosia*) *humilis* Meigen
Fig. 24.—*Coenosia* (*Hoplogaster*) *laeta* new species
Fig. 25.—*Coenosia* (*Hoplogaster*) *mollicula* (Fallén)
Fig. 26.—*Coenosia* (*Hoplogaster*) *nigritarsis* (Stein)
Fig. 27.—*Schoenomyza dorsalis* Loew
Fig. 28.—*Schoenomyza litorella* (Fallén)
Fig. 29.—*Schoenomyza convexifrons* Malloch
Fig. 30.—*Schoenomyza chrysostoma* Loew

Plate VII

Ventral aspect of fifth abdominal sternum in male

Fig. 31.—*Coenosia* (*Neodexiopsis*) *calopyga* Loew
Fig. 32.—*Coenosia* (*Neodexiopsis*) *major* (Malloch)
Fig. 33.—*Coenosia* (*Neodexiopsis*) *basalis* (Stein)
Fig. 34.—*Coenosia* (*Neodexiopsis*) *ovata* Stein
Fig. 35.—*Coenosia* (*Neodexiopsis*) *rufitibia* Stein
Fig. 36.—*Coenosia* (*Hoplogaster*) *mollicula* (Fallén)
Fig. 37.—*Coenosia* (*Hoplogaster*) *nigritarsis* (Stein)
Fig. 38.—*Coenosia* (*Hoplogaster*) *laeta* new species
Fig. 39.—*Coenosia* (*Coenosia*) *tigrina* (Fabricius)
Fig. 40.—*Coenosia* (*Coenosia*) *humilis* Meigen
Fig. 41.—*Bithoracochaeta leucoprocta* (Wiedemann)
Fig. 42.—*Schoenomyza dorsalis* Loew
Fig. 43.—*Schoenomyza litorella* (Fallén)
Fig. 44.—*Schoenomyza chrysostoma* Loew
Fig. 45.—*Schoenomyza convexifrons* Malloch

STUDIES IN THE AMERICAN HESPERIOIDEA
PAPER III

(LEPIDOPTERA)

BY ROSWELL C. WILLIAMS JR., AND ERNEST L. BELL

(Plate VIII)

On the Synonymy of Some Species

Autochton neis (Geyer)

1820. *Cecrops neis* Hubner, Verz. bek. Schmett., p. 104.
1832. *Cecrops neis* Geyer, Zutr. Samml. Exot. Schmett., IV, p. 10, figs. 619, 620. [Brazil].
1882. *Cecropterus lunulus* Plotz, Berlin Ent. Zeit., XXVI, p. 261. [South America].
1882. *Cecropterus bocus* Plotz, Berlin Ent. Zeit., XXVI, p. 262. [Para].
1891. *Cecropterus integrifascia* Mabille, Ann. Soc. Ent. Belg., XXXV, c.r., p. lxxvii. [San Paulo, Rio Grande, Brazil].
1891. *Cecropterus dhega* Mabille, Ann. Soc. Ent. Belg., XXXV, c.r., p. lxxvii. [Jalapa].
1893. *Cecropterus neis* Godman & Salvin, Biol. Cent.-Amer., Rhop., II, p. 328, pl. 80, fig. 2 (male genitalia).
1901. *Cecropterus dhega* Godman, Biol. Cent.-Amer., Rhop., II, Suppl., p. 737. (As synonym of *neis*).
1903. *Cecropterus neis* Mabille, Gen. Ins., XVII, p. 29.
1903. *Cecropterus integrifascia* Mabille, Gen. Ins., XVII, p. 29. (As synonym of *neis*).
1907. *Cecropterus lunulus* Godman, Ann. & Mag. Nat. Hist., (7), XX, p. 136.
1907. *Cecropterus bocus* Godman, Ann. & Mag. Nat. Hist., (7), XX, p. 136.
1912. *Cecropterus bocus* Mabille & Boullet, Ann. Soc. Nat. Zool., (9), XVI, p. 124.
1912. *Cecropterus reflexus* Mabille & Boullet, Ann. Soc. Nat. Zool., (9), XVI, p. 124. [Santa Catharina].
1912. *Cecropterus integrifascia* Mabille & Boullet, Ann. Soc. Nat. Zool., (9), XVI, p. 126. (As synonym of *bocus*).
1918. *Spathilepia agathokles* Ehrmann, Lepidoptera, II, p. 66. [Saupure, Venezuela].
1922. *Cecropterus neis* Draudt, Seitz Macrolep., V, p. 870, pl. 168g.
1922. *Cecropterus lunulus* Draudt, Seitz Macrolep., V, p. 870, pl. 168g.
1922. *Cecropterus bocus* Draudt, Seitz Macrolep., V, p. 870, pl. 172d.
1927. *Cecropterus agathocles* Holland, Ann. Carnegie Mus., XVII, p. 345.

Hubner first used the name *neis* for this species but gave no description, Geyer later describing and figuring it.

This species has an extended geographical range, being found from Mexico to south Brazil and is extremely variable in maculation on both surfaces of the wings. The males very often lack the small hyaline spot of the discal band of the primaries, lying in the base of interspace 3.

In *bocus* the lowest spot of the hyaline discal band of the primaries appears to be somewhat out of alignment with the rest of the band and to be placed somewhat vertically under or near the outer corner of the spot above it. This form is usually found in the male sex. Godman placed *bocus* as a variety of *itylus* Hubner, but the Plotz description and the figure given by Draudt, presumably from the Plotz figure, seem to indicate that it belongs here.

Plotz gave no definite locality for his *lunulus* but the description well agrees with specimens at hand from south Brazil having a somewhat paler ground color of the underside of the secondaries against which the two brown bands are strongly constrasted. These two brown bands are sometimes very broad and confluent in the costal area of the wing.

Mabille placed his *integrifascia* as a synonym of *neis*, and Mabille & Boullet placed it as a synonym of *bocus*, but as both names represent the same insect the discrepancy is of no importance, and the name is left in synonymy where it was placed by the author. The description of *integrifascia* states that there are four hyaline apical dots and there are not more than three of these dots present in our series of *neis*.

Godman is undoubtedly correct in placing *dhega* as a synonym of *neis* and his action is followed here.

Mabille & Boullet's *reflexus*, which was described from three females represents a form of that sex in which the lowest hyaline spot of the discal band of the primaries is excavated on its inner margin, producing a sharply pointed angle directed inwardly on vein 1. This is usually more prominently shown in female specimens from the southern part of the range of the insect but it is also present in some degree in occasional individuals from other parts.

Bungalotis annulicornis (Moschler)

1876. *Telegonus annulicornis* Moschler, Verh. k. k. Zool.-Bot. Ges. Wien, XXVI, p. 326. [Surinam].

Annulicornis is evidently a *Bungalotis* and not a *Nascus* as usually placed by authors, as the long, thin antennal club and apiculus and entire habitus of the insect is like the female of *midas* Cramer. The outer discal hyaline spot of *annulicornis* is placed just below the extreme cell-end, while the corresponding spot of the female *midas* is placed well inside the cell-end and thus nearer to the discal band.

Nascus phocus (Cramer)

1779. *Papilio phocus* Cramer, Pap. Exot., II, p. 102, pl. 162, fig. F. [Surinam].

1848. *Papilio decemmaculata* Sepp, Surinam. Vlind., I, pl. 50. [Surinam].

The Cramer and Sepp figures very evidently represent the same insect and the type of both *phocus* and *decemmaculata* came from Surinam and the latter name is therefore to be added to the other synonyms of the former.

Achalarus albociliatus (Mabille)

1877. *Telegonus albociliatus* Mabille, Pet. Nouv. Ent., II, p. 162. [Colombia; Panama; Guatemala].

1882. *Eudamus albociliata* Plotz, Stett. Ent. Zeit., XLIII, p. 100. [Colombia].

1882. *Eudamus jalapus* Plotz, Stett. Ent. Zeit., XLIII, p. 100. [Jalappe].

1894. *Murgaria albociliata* Godman & Salvin, Biol. Cent.-Amer., Rhop., II, p. 333, pl. 80, figs. 12, 13 and 14 (male genitalia).

1922. *Cogia* (*Achalarus*) *albociliata* Skinner & Williams, Trans. Amer. Ent. Soc., XLVIII, p. 121, fig. 23 (male genitalia).

1922. *Rhabdoides jalapus* Draudt, Seitz Macrolep., V, p. 871, pl. 169b.

1922. *Murgaria albociliata* Draudt, Seitz Macrolep., V, p. 875, pl. 170c.

The writers have received a letter from Dr. Martin Hering of the Zoologisches Museum, Berlin, Germany, stating that in his opinion the Plotz type of *jalapus*, which is contained in the Museum collection as stated in the original description, is a female of *Achalarus albociliatus* Mabille and that they also possess another female *albociliatus* from the same collector and from the same locality, which entirely agrees with the type of *jalapus*. *Jalapus* must therefore sink as a synonym of *albociliatus* Mabille. The Draudt figure of *jalapus* appears to represent *albociliatus*.

Achalarus albociliatus race **leucophrys** (Mabille)

1897. *Murgaria leucophrys* Mabille, Ann. Soc. Ent. France, p. 183. [Bogota; Chiriqui].

Leucophrys is apparently the southern race of *albociliatus*, distinguished by the darker ground color of the wings and the fringes of the primaries being white as well as those of the secondaries. The form of the male genitalia does not differ from that of the typical insect.

Cogia cajeta (Herrich-Schaffer)

1869. *Eudamus cajeta* Herrich-Schaffer, Corres. Blat. Zool.-Min. Ver. Regensb., XXIII, p. 188.

1894. *Cogia cajeta* Godman & Salvin, Biol. Cent.-Amer., Rhop., II, p. 339, pl. 81, figs. 1, 2 and 3 (male genitalia). [Jalapa and Teapa, Mexico].

1922. *Cogia cajeta* Draudt, Seitz Macrolep., V, p. 877, pl. 170d, e.

Cogia cajeta form **eluina** Godman & Salvin

1894. *Cogia eluina* Godman & Salvin, Biol. Cent.-Amer., Rhop., II, p. 339, pl. 81, figs. 4, 5. [Mexico; Guatemala].

1922. *Cogia eluina* Draudt, Seitz Macrolep., V, p. 877, pl. 170e, f.

Eluina appears to represent a race of *cajeta* in the southern limits of that species and to occur as a form of it in Mexico. It is distinguished by the darker ground color of the wings, the entire absence of the hyaline spots of the primaries, and the obsolescence of the dark bands of both wings.

The Draudt figure shows an indication of the hyaline spots. There is such an example in the Academy collection from Iguala, Mexico.

The form of the male genitalia, taken from a specimen from Guatemala and agreeing with the Biologia figure of *eluina*, does not differ from that of typical *cajeta* from Mexico as figured by Godman & Salvin.

Hyalothyrus neleus (Linnaeus)

1758. *Papilio neleus* Linnaeus, Syst. Nat., (10), I, p. 488. ["In Indiis"].

1764. *Papilio nileus* Clerck, Icones, t. 45, fig. 2.

1862. *Phareas priscus* Felder, Wien. Ent. Monat., VI, p. 184. [Rio Negro, Brazil].

1867. *Phareas priscus* Felder, Reise Nov., Lep., III, pl. 73, fig. 6.

1871. *Entheus neleus* Kirby, Cat. Diurn. Lep., p. 580.

1876. *Telegonus lacydus* Druce, Proc. Zool. Soc. London, p. 247, pl. 18, fig. 10. [Ucayali, Peru].

1882. *Hesperia aon* Plotz, Stett. Ent. Zeit., XLIII, p. 322. (Under *lacydus* Druce). [Para].

1888. *Lignyostola pemphigargyra* Mabille, Le Nat., (2), II, p. 221. [Chiriqui].
1894. *Lignyostola lacydus* Godman & Salvin, Biol. Centr.-Amer., Rhop., II, p. 350, pl. 81, fig. 25 (male genitalia).
1894. *Hyalothyrus neleus* Godman & Salvin, Biol. Centr.-Amer., Rhop., II, p. 351, pl. 81, fig. 27.
1922. *Hyalothrus neleus* Draudt, Seitz Macrolep., V, p. 882, pl. 171f.

Despite the different superficial appearance of *neleus* and *lacydus* they are the sexes of one species, the former being the female and the latter the male. The wing shape, allowing for the slight sexual differences usually found among the *Hesperiidae*, palpi, antennae, the legs and their appendages are the same in both. The difference in coloration of the two sexes is not unusual in the *Hesperiidae* and is well illustrated in the genus *Entheus* to which *Hyalothyrus* is related.

During a recent trip to Barro Colorado Island, Canal Zone, Panama, Mr. E. I. Huntington collected several specimens of both sexes which he has generously presented to Mr. Bell, some of these being taken together at the same place and time, though not in actual copulation. Specimens of both have been received from other collectors from the same localities, and in all cases the specimens of *neleus* are females and those of *lacydus* are males, so the association of the two as sexes of one species is obvious.

Godman & Salvin record *lacydus* from Nicaragua; Panama; Colombia; Upper Amazon Valley; Eastern Peru; and *neleus* from Nicaragua; Panama; Amazon Valley; Guiana. There are specimens of both sexes in the Bell collection from Barro Colorado Island, Canal Zone, Panama; St. Laurent, French Guiana; and from several localities in eastern Peru, and a female from Cauca, Colombia. In the collection of the Academy of Natural Sciences there are specimens of both sexes from Chiriqui; Canal Zone, Panama, and Paramaribo, Dutch Guiana, and a male "Amazons."

Pyrgus notatus (Blanchard)

1852. *Hesperia notatus* Blanchard, Gay, Hist. fisc. y polit. de Chile, VII, p. 45. [Santa Rosa, and other localities, Chile].
1864. *Pyrgus adepta* Herrich-Schaffer, Corresp.-blatt. Zool.-Min. Ver. Regensb., XVIII, p. 171. (ms. name).
1884. *Pyrgus adepta* Plotz, Mitt. Nat. Ver. Neu-Vorpomm. u. Rug., XV, p. 3. [Bogota].

1886. *Pyrgus* (*Syrichthus*) *adepta* Snellen, Tijds. voor Ent., xxx, p. 30, pl. 2, fig. 4.
1899. *Hesperia notata* Godman & Salvin, Biol. Cent.-Amer., Rhop., II, p. 451, pl. 90, figs. 31, 32.
1921. *Hesperia notata* Reverdin, Bull. Soc. Ent. Geneve, IV, p. 181, pl. vi, fig. 14, pl. vii, fig. 3 (male genitalia).
1923. *Heliopetes adepta* Draudt, Seitz Macrolep. of the World, V, p. 914. (As synonym of *domicella* Erichson).

Herrich-Schaffer published no description of *adepta* but merely mentioned the name in his description of *crisia*. Plotz included *adepta* in the section of *Pyrgus* containing *Heliopetes domicella* Erichson, *aconita* Plotz and *willi* Plotz, the last two names being now considered as synonyms of the first and for this reason it is probable that *adepta* has become to be also considered as a synonym of *domicella*, particularly as small examples of *domicella* very much resemble *notatus*, however, in his description, Plotz states that the primaries have a white spot in the basal area of cell 1 and another in the angle of cell 2, these two spots do not occur in any of the considerable series of *domicella* which we have examined but are present in *notatus*.

It is believed that Snellen has correctly identified the insect described as *adepta* by Plotz and his figure is a very evident *notatus*.

Catia otho race **curassavica** (Snellen)

1886. *Hesperia curassavica* Snellen, Tijds. voor Ent., xxx, p. 28, pl. 2, figs. 3, 3a. [Curacao].
1906. *Pamphila winslowi* Weeks, Psyche, XIII, p. 69. [Suapure, Venezuela].
1911. *Pamphila winslowi* Weeks, Ill. Diurn. Lep., II, p. 15, pl. 10, fig. 1.

This is the race of *otho* Abbot & Smith occurring in Central America; Trinidad; Curacao; and northern parts of South America, distinguished by the more extended and paler yellowish maculation and the more distinctly defined yellow stripe in the cell of the secondaries above.

Cobalus arita Schaus

1902. *Cobalus arita* Schaus, Proc. U. S. Nat. Mus., XXIV, p. 441. [Trinidad].
1914. *Cobalopsis musa* Kaye, Trans. Ent. Soc. London (for 1913), p. 577, pl. 30, fig. 6. [Trinidad].
1925. *Cobalus arita* Lindsey, Denison Univ. Bull., XXI, p. 100, pl. 26, fig. 4; pl. 30, fig. 5 (male genitalia).

Musa Kaye is a synonym of *arita* Schaus. There is considerable variation in size of individuals as well as in maculation. Examples from southern Brazil are often larger than those from more northern localities. The secondaries beneath may have a suffusion of purplish or lack it. The primaries may have one or two cell spots or entirely lack them.

This species has a wide geographical range and is represented in our collections by specimens from Trinidad; French Guiana; Peru; and localities in Santa Catharina Province, Brazil. Dr. Lindsey also records it from Panama and British Guiana.

Eutychide rogersi (Kaye)

1914. *Cobalopsis rogersi* Kaye, Trans. Ent. Soc. London, (for 1913), p. 580, pl. 30, fig. 3. [Trinidad].

This insect has a stigma on the primaries of the male of the same construction as that found in the genus *Eutychide* and appears to be very closely related to *complana* Herrich-Schaffer (*midia* Hewitson) and *ochus* Godman. From the former it differs in the smaller and more purely white hyaline spots of the primaries and differently colored under side of the secondaries than shown in the Biologia figures and from the latter in the green thorax above and different color of the secondaries beneath. The form of the male genitalia is very similar to that given in the Biologia for *midia*.

Euroto sylvia (Kaye)

1914. *Phanis sylvia* Kaye, Trans. Ent. Soc. London (for 1913), p. 576, pl. 30, fig. 14. [Trinidad].

The form of the male stigma is the same as that of the genus *Euroto*, and *sylvia* is closely related to *compta* Butler, from which it may be distinguished on the underside of the wings by the pale purplish color of the apical area of the primaries and the entire secondaries except the abdominal fold, and the pale lilacine-white spots of the discal band and the cell spot of these wings. The two discal spots of the primaries above are usually somewhat larger than those of *compta*. The form of the male genitalia is very similar to that of *compta* but in those specimens examined differs slightly in the terminal arm of the claspers.

Sylvia is not restricted to Trinidad as there are specimens at hand from Moengo, Surinam; Obidos, Brazil; Iquitos, Peru, and Villarrica, Paraguay.

Thracides hermesia (Hewitson)

1870. *Hesperia hermesia* Hewitson, Equat. Lep., p. 71. [Ecuador].
1914. *Nyctus triangularis* Kaye, Trans. Ent. Soc. London (for 1913), p. 579, pl. 30, fig. 7. [Trinidad].
1921. *Nyctus triangularis* Kaye, Mem. Dept. Agr., Trinidad & Tobago, II, p. 136.
1924. *Thracides hermesia* Draudt, Seitz Macrolep., V, p. 994, pl. 191e.
1931. *Thracides hermesia* Williams & Bell, Trans. Amer. Ent. Soc., LVII p. 285, fig. 34 (male genitalia).

Triangularis is a synonym of *hermesia*. In addition to the type localities mentioned above, Draudt records Colombia and there are specimens in both the Bell and Academy collections from Peru.

Thracides braesia (Hewitson)

1867. *Hesperia braesia* Hewitson, Descr. One Hundr. New Spec. Hesp., (1) p. 24. [Para].

During the early part of March 1933, Mr. Albert S. Pinkus collected two larvae of this species on *Canna* in the Botanical Gardens at Port of Spain, Trinidad. These larvae pupated in the leaves of the food-plant, spinning a silken mat and rolling a portion of the leaves into a tube-like cocoon. From the pupae a male emerged on March 28 and a female on March 30. Mr. Pinkus also collected a female specimen of this species at Brasso, Trinidad, on April 2. It is of interest to note another large Hesperid feeding on *Canna* in addition to *Calpodes ethlius* Cramer.

On the Male Genitalia of Certain Species

Telegonus halesius (Hewitson) (Pl. VIII, Fig. 5)

1877. *Eudamus halesius* Hewitson, Ann. & Mag. Nat. Hist., (4), XX, p. 321. [Cayenne].

This species was discussed and the details of the genitalia given in the previously published part of this paper.

Autochton cincta (Plotz) (Pl. VIII, Fig. 3)

1882. *Cecropterus cincta* Plotz, Berlin Ent. Zeit., XXVI, p. 261. [Oaxaca].
1894. *Cecropterus cinctus* Godman & Salvin, Biol. Centr.-Amer., Rhop., II, p. 329, pl. 80, fig. 3.
1912. *Cecropterus cinctus* Mabille & Boullet, Ann. Sci. Nat. Zool., XVI, pp. 122, 126.

The uncus is divided into two slender arms. The scaphium slender. The aedoeagus carries a heavy internal spine. The

termination of the claspers is divided into two arms, the lower one longer than the upper and with a rounded apex, back of which on the dorsal edge is a small flange with two apical teeth. The upper arm is more slender and with a small tooth at the ventral angle of the apex.

Mabille & Boullet record a female specimen from Brazil but the occurrence of the species in this locality needs confirmation.

Autochton sulfureolus (Mabille) (Pl. VIII, Fig. 10)

1883. *Cecropterus sulfureolus* Mabille, Ann. Soc. Ent. Belg., XXVII, C.R., p. lv. [Brazil].

The uncus is divided into two rather short arms. The scaphium is weakly developed. The aedoeagus in comparison with the other parts is very large. The claspers terminate in a long recurved hook with a well developed tooth on the outer edge.

Autochton vectilucis (Butler) (Pl. VIII, Fig. 8)

1872. *Eudamus vectilucis* Butler, Lep. Exot., p. 109, pl. 40, fig. 6. [Cartago, Costa Rica].

1894. *Cecropterus vectilucis* Godman & Salvin, Biol. Centr.-Amer., Rhop., II, p. 329.

The uncus is divided into two slender arms. The scaphium better developed than in *sulfureolus*. The aedoeagus carries a short internal spine near the apex. The claspers terminate in a short, rounded flange, back of which the dorsal edge rises rather abruptly into a short flange with some fine serrations on the rounded apex, between this and the dorsal edge of the disc is a rounded excavation.

Bungalotis erythus (Cramer) (Pl. VIII, Fig. 12)

1779. *Papilio erythus* Cramer, Pap. Exot., I, p. 93, pl. 59, fig. G. [Surinam].

The uncus is rather short and very broad at the apex which has a short flange on each corner and is rounded between them. The scaphium is composed of two rather long arms with numerous fine, hair-like teeth at the apex. The aedoeagus is long and slender, with two clusters of internal spines, one close to the apex and the other a short distance in back of it. The claspers are long and rather slender, terminating in a narrow, rounded flange, back of which the dorsal edge is produced upward into a broad triangular flange. At the base of the terminal arm, the dorsal edge of the disc is produced forward into a short, somewhat rounded flange.

The two sexes of this species are alike in maculation, the females having the wings a little more rounded, and, of course, lack the costal fold of the male.

Bungalotis sebrus (Felder) (Pl. VIII, Fig. 7)

1867. *Eudamus sebrus* Felder, Reise Osterr. Freg. Novara, Lep., II, p. 509, pl. 71, fig. 1. [Bahia].

The uncus resembles that of *salatis* Cramer, terminating in a short, down-curved apex, back of which rises a rounded dorsal flange. The scaphium is well developed. The aedoeagus carries a few slender, internal spines. The claspers are broad, truncate at the apex, and somewhat sinuous on the dorsal edge.

There is a male specimen of *sebrus* at hand which lacks the usual hyaline spots of the primaries found in this species, the apical spot and that above vein 3 being replaced by black dots. This specimen came from Peru and does not differ from typical specimens in the form of the male genitalia.

Nascus broteas (Cramer) (Pl. VIII, Fig. 13)

1782. *Papilio broteas* Cramer, Pap. Exot., III, p. 161, pl. 283, figs. C, D. [Surinam].

The insect associated as the male of *broteas* was received from French Guiana together with a female agreeing with the Cramer figure. This male is very much like *phocus* Cramer in general appearance, the hyaline spots of the primaries are a little paler yellow, the spot below vein 2 is very minute, a mere dot, the lowest spot of the subapical series, in cell 5, is larger than in *phocus* and wedge-shaped, the spot in cell 6 is much more elongated than in *phocus* and approximately of the same length as that in cell 5, the spot in cell 7 is small and narrow, those of cells 8 and 9 are elongate and one above the other, in *phocus* these two spots are less elongate and that in cell 9 is placed basally beyond the one in cell 8. The other spots of the discal band are similar to those of *phocus* but less elongate and there is also a hyaline spot on the costal margin above the cell spot, the small spot in cell 4 is similar to that of *phocus*.

The basal third of the primaries and all of the secondaries, except the costal area above 7 which is brown, are pale yellow fulvous. The secondaries have a faint indication of two narrow, brown bands, the inner a mere dot just below vein 6 in the basal

third of the wing and the other a dot below each of veins 5, 6, 7, in the center of the disc. Beneath the primaries are brown, yellow at the base, and pale brown on the inner margin. The secondaries have the basal three-quarters pale yellow, the rest brown, with a narrow brown band beginning below vein 7, narrowly separated from the brown border, and extending to vein 2 where it merges with the brown border. The palpi beneath are white at the base and become mixed with brownish toward the tip. Although the female is differently colored, as is the case with other related species, the general characteristics are the same in these two specimens and the association of this male with the female agreeing with the Cramer figure seems to be justified.

The uncus has a short, rounded, down-curved apex. The aedoeagus has a number of irregularly placed internal spines at the apex, some of which project a little beyond it. The claspers are short, rather broad at the apex which has a short, forward projection from both the ventral and dorsal edges.

Nascus phaselis (Hewitson) (Pl. VIII, Fig. 1)

1867. *Eudamus phaselis* Hewitson, Descr. One Hund. New Spec. Hesp., (1), p. 14. [Brazil].

1922. *Nascus phaselis* Draudt, Seitz Macrolep. of the World, v, p. 873, pl. 169d.

The uncus is divided into two rather short, slender, pointed arms, from the base there rises from each side a slender pointed flange directed obliquely upward and forward. The aedoeagus is rather long and sinuous. The claspers terminate in a slender, obliquely upturned arm with some fine serrations at the apex.

Nascus polygius (Latreille) (Pl. VIII, Fig. 9)

1824. *Hesperia polygius* Latreille, Enc. Meth., IX, p. 745. [Locality ?].

Polygius is usually included by authors in the genus *Bungalotis*, but in all of its characteristics it more nearly agrees with *phocus*, the type of *Nascus* than it does with *midas* the type of *Bungalotis*.

The uncus is a single slender arm curved downward at the apex. The scaphium is well developed. The aedoeagus carries a considerable number of internal spines in the apical half. The claspers have the ventral edge turned obliquely upward in the apical third and the dorsal edge of the terminal arm is irregularly eroded.

Nascus advena (Mabille) (Pl. VIII, Fig. 4)

1889. *Telegonus advena* Mabille, Le Nat., (2), III, p. 59, fig. 1. [Chiriqui].
1893. *Nascus advena* Godman & Salvin, Biol. Centr.-Amer., Rhop., II, p. 323, pl. 79, figs. 6, 7.

The uncus terminates in two short arms. The scaphium is quite well developed. The termination of the claspers is a somewhat slender arm, abruptly curved upward and obliquely backward from its base so that the inner edge lies very close to the dorsal edge of the disc. The inner edge and apex of the terminal arm carry a number of short serrations.

Ablepsis guyanensis Mabille & Boullet (Pl. VIII, Fig. 6)

1912. *Ablepsis guyanensis* Mabille & Boullet, Ann. Sci. Nat. Zool., (9), XVI, p. 156. [Cayenne, French Guiana].

The uncus terminates in two slender arms. The scaphium is poorly developed. The aedoeagus carries a number of internal spines. The claspers terminate in a triangular apex, with another small triangular flange on the dorsal edge at the base of the terminal arm.

Aethilla eleusinia Hewitson (Pl. VIII, Fig. 2)

1868. *Aethilla eleusinia* Hewitson, Descr. One Hundred New Spec. Hesp., (2), p. 55. Quito.

The uncus is a little widened and somewhat angular at the apex, at the base on each side a slender flange arises and projects obliquely upward and forward. The scaphium is well developed. The claspers are somewhat truncate at the apex, forming a broad dorsal flange on the terminal arm and having numerous fine serrations. At the base of the terminal arm are two small flanges. The aedoeagus is long and slender.

Porphyrogenes omphale (Butler) (Pl. VIII, Fig. 11)

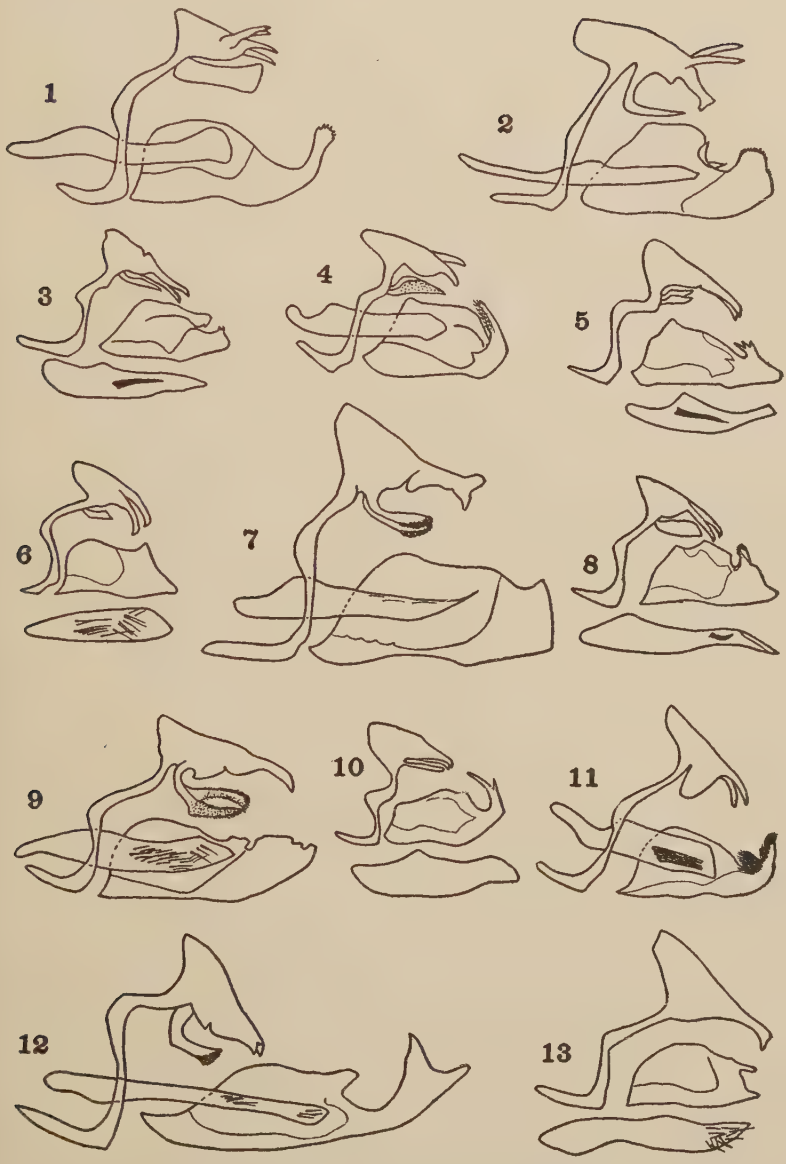
1871. *Telegonus omphale* Butler, Ann. & Mag. Nat. Hist., VIII, p. 284. Ega; Venezuela. 1872. Lep. Exot., p. 110, pl. 40, fig. 10.

The uncus terminates in two slender arms. The aedoeagus carries a cluster of internal spines. The claspers terminate in a narrow upturned arm with a number of hair-like spines on the inner edge and a dense cluster of similar though larger ones directed inwardly from the dorsal edge near the base of the terminal arm.

Explanation of Plate VIII

Male Genitalia

Fig. 1.—*Nascus phaselis* Hewitson. Colombia.
Fig. 2.—*Aethilla eleusinia* Hewitson. Ecuador.
Fig. 3 —*Autochton cincta* Plotz. Mexico.
Fig. 4.—*Nascus advena* Mabille. Panama.
Fig. 5.—*Telegonus halesius* Hewitson. Ecuador.
Fig. 6.—*Ablepsis guyanensis* Mabille & Boullet. French Guiana.
Fig. 7.—*Bungalotis sebrus* Felder. French Guiana.
Fig. 8.—*Autochton vectilucis* Butler. Chiriqui.
Fig. 9.—*Bungalotis polygius* Latreille. Brazil.
Fig. 10.—*Autochton sulfureolus* Mabille. Rio Janeiro, Brazil.
Fig. 11.—*Porphyrogenes omphale* Butler. Bolivia.
Fig. 12.—*Bungalotis erythus* Cramer. Bolivia.
Fig. 13.—*Nascus broteas* Cramer. French Guiana.



WILLIAMS AND BELL—AMERICAN HESPERIOIDEA

A REVISION OF THE NORTH AMERICAN SPECIES BELONGING TO THE GENUS COENOSIA MEIGEN AND RELATED GENERA

(DIPTERA: MUSCIDAE)

PART II. THE SUBGENUS LIMOSIA (COENOSIA OF AUTHORS)[1]

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(Plates IX–XIV)

Part I of this series dealt with the genera *Allognota* Pokorny, *Bithoracochaeta* Stein, *Schoenomyza* Haliday and gave a general discussion of the genus *Coenosia* Meigen and its subgenera *Neodexiopsis* Malloch, *Coenosia* Meigen and *Hoplogaster* Rondani. It also contained a list of the principal collections upon which this work is based and which are referred to by combinations within brackets [ ]; also a list of the literature cited and which is referred to by figures within parentheses ( ). The present part treats of the remaining coenosian subgenus *Limosia* Robineau-Desvoidy (*Coenosia* of authors).

Subgenus **Limosia** Robineau-Desvoidy
(*Coenosia* sens.-str. of authors)

Limosia Robineau-Desvoidy, Essai Myod., p. 535, 1830. Coquillett, Proc. U. S. Nat. Mus., XXXVII, p. 501, 1910.

Palusia Robineau-Desvoidy, Essai Myod., p. 542, 1830. Coquillett, Proc. U. S. Nat. Mus., XXXVII, p. 583, 1910.

Eriostyla Lioy, Atti Inst. Veneto, (ser. 3), IX, p. 997, 1864.

Coenosia Rondani, Della Soc. Ital. Scienz. Natur., IX, p. 76, 1866. Stein, Arch. f. Naturgesch., LXXXIII, (1917), A, hft 1, p. 158, 1919. Stein, Arch. f. Naturgesch., LXXXIV, (1918), A, hft 9, p. 93, 1920. Malloch, Ent. News, XXXII, pp. 107 and 201, 1921. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 237, 1925. Huckett, Mem. 101 N. Y. (Cornell) Agr. Exp. Station, (1926), p. 835, 1928.

Centriocera Pokorny, Verh. zool.-bot. Ges. Wien, XLIII, p. 537, 1893.

Macrocoenosia Malloch, Trans. Amer. Ent. Soc., XLVI, p. 162, 1920. Malloch, Ent. News, XXXII, p. 107, 1921. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 238, 1925. Huckett, Mem. 101 N. Y. (Cornell) Agr. Exp. Station, (1926), p. 836, 1928.

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[1] Part I. Trans. Am. Ent. Soc., LX, pp. 57–119, (1934).

There are evidently three generic names which may be considered for supplanting that of *Coenosia sens-str.* of authors.

In 1893 Pokorny (33) proposed the genus *Centriocera* with type *Coenosia decipiens* Meigen (= *Musca pedella* Fallén), a species which is generally assumed to be congeneric with *Musca geniculata* Fallén, the type of *Coenosia* of authors.

In 1901 Coquillett (4) arbitrarily designated genotypes for Robineau-Desvoidy's little known genera *Limosia* and *Palusia*. *Limosia campestris* Robineau-Desvoidy was made the type of *Limosia*, a species first mentioned by Macquart (13) along with *Palusia testacea* Robineau-Desvoidy as synonyms of *Coenosia albicornis* Meigen. Stein (48) listed *campestris* as a distinct species with no further reference than that of its original description; *albicornis* is regarded as composed of two species, the male being a synonym of *Musca pumila* Fallén, and the female along with *testacea* as possible synonyms of *Anthomyza tricolor* Zetterstedt. Zetterstedt himself (62) had previously listed *albicornis* and *testacea* as synonyms of *pumila*. For *Palusia*, Coquillett designated *Palusia testacea* as type. Neither genera were recognised as valid by Stein or Coquillett, both being considered synonymous with *Coenosia*.

In 1911 Schnabl and Dziedzicki (42) designated *Palusia femoralis* Robineau-Desvoidy as type of *Palusia*, and at the same time placed *Centriocera* in synonymy. Stein (48) had listed *femoralis* as a synonym of *geniculata*, and all that can be deduced regarding its character and relationship is to be found in the generic diagnosis provided by Schnabl and Dziedzicki.

Whatever conclusions may be drawn regarding the identities of the above species, it seems selfevident that they may be regarded as closely allied, even congeneric. Under such conditions, I have considered the name *Limosia* as valid for the group known to authors as *Coenosia sens.-str.*, on the grounds of priority. The type, *Limosia campestris*, was arbitrarily selected by Coquillett from an original series of twenty-eight nominal species, none of which have been recognised by subsequent authors.

My conception of the group follows closely that of Stein (51) and Malloch (20) in their later treatments of the genus *Coenosia*. The most significant departure from their system of classification

has been the removal of *Coenosia ovata* and *C. rufitibia* to the subgenus *Neodexiopsis*. For the present I have preferred to unite the species belonging to Malloch's genus *Macrocoenosia* with those of *Limosia*, since I have found the proposed delimiting character, namely, the strong mid posterodorsal bristle on hind tibia, a variable character which appears in species belonging to other groups, e.g., *Neodexiopsis* and *Hoplogaster*.

I have restricted the subgenus *Limosia* to those species of the genus *Coenosia* that lack the posterior preapical bristle on hind femur, as is present in *Neodexiopsis;* which lack a strong mid ventral bristle at apex of fore tibia and a bristle on anterior surface of hind tibia situated closely adjacent the median anterodorsal bristle, as is present in *Coenosia sens.-str.*, and to those species whose lower (under) calyptra projects conspicuously beyond the margin of upper calyptra, as contrasted to the inconspicuous difference in development of upper and lower calyptrae in *Hoplogaster*.

This subgenus is by far the largest of the four occurring in North America, being represented by forty-seven species and two varieties, of which twelve constitute new records.

Key to Species of Limosia

Males

1. All femora blackish except possibly at apices 2
   Mid and hind femora yellow in part on proximal half, or entirely yellow 9
2. Hind tibia with a well developed bristle at middle of posterodorsal surface, and with 2 longish bristles at apex on ventral surface; with apical posterodorsal bristle well developed, about equal in length to apical anterodorsal bristle.
   1. *cilicauda* Malloch
   Hind tibia with no well developed bristle at middle of posterodorsal surface, and with 1 longish bristle at apex of ventral surface; with the apical posterodorsal bristle weakly developed, shorter than apical anterodorsal bristle 3
3. Halteres black; frons, face, and antennae sooty black; wings smoky . . . . . 2. *effulgens* new species
   Halteres yellow; frons, face, at least in part grayish pruinescent; wings clear 4

4. Hind tibia and hind tarsus blackish; fore and mid tibiae yellow; fore and mid tarsi yellow except fifth tarsal segment which is blackish; hind femur with a preapical bristle on posterior surface.....3. *nigricoxa* Stein

   All tibiae yellowish, the fore tibiae occasionally infuscated; or, the fore and hind tibiae at least largely blackish or infuscated, the fore tibiae occasionally yellowish testaceous; all tarsi black; hind femur with no preapical bristle on posterior surface.....5

5. Hind tibiae with apical bristles approximated, situated on about the same transverse plane; mid femur with one preapical bristle on posterior surface; third antennal segment with a noticeable spinular process at apex of dorsal (upper) surface.....4. *pygmæa* (Zetterstedt)

   Hind tibiae with apical mid dorsal bristle situated on a plane distinctly basad of apical anterodorsal bristle; mid femur with 2 preapical bristles on posterior surface; third antennal segment with no spinular process at apex of dorsal (upper) surface.....6

6. Mid femora with a preapical bristle on anterior surface; fore tibia with apical posterodorsal bristle well developed, about equal in length to diameter of tibia where situated.....7

   Mid femora with no preapical bristle on anterior surface; fore tibia with apical posterodorsal bristle setulose, shorter in length than diameter of tibia where situated.....8

7. Mid and hind femora broadly yellowish on apical region, blackish infuscated to base, the yellowish area on mid femur extending basad to include the preapical bristles on posterior surface; abdominal bristles finely developed; fifth sternum shallowly excised, processes broader than long, sparsely bristled.....5. *aliena* Malloch

   Mid and hind femora narrowly yellowish at apex, with trace of yellowish at base, the yellowish area on mid femur not extending to preapical bristles on posterior surface; abdominal bristles stoutly developed; fifth sternum deeply cleft, processes longer than broad, with numerous fine setulae along inner margin.....6. *alticola* Malloch

8. Tibiae largely infuscated, blackish.....7. *fraterna* Malloch

   Tibiae yellowish.....8. *nigrescens* Stein

9. Hind tibiae with a dense series of fine longish bristles on anterior and dorsal surfaces; hind femur with no series of bristles on anteroventral or anterodorsal surfaces; mid tibia with 2 or 3 strong bristles at apex of dorsal surface; mid femur with no preapical posterior bristle; fore femur with no series of bristles on posterodorsal or posteroventral surfaces.....9. *tausa* new species

Hind tibiae with no dense series of longish bristles on anterior and dorsal surfaces; hind femur with a series of bristles on anteroventral and anterodorsal surfaces; mid tibia with at most one strong apical bristle on dorsal surface; mid femur with a preapical posterior bristle; fore femur with a series of bristles on posterodorsal or posteroventral surface...10

10. All tibiae and femora with exceptionally long, fine, curling bristles; hind tibia with mid anterodorsal and apical mid dorsal bristles about three-quarters as long as hind tibia, mid anteroventral and apical anterodorsal bristles about as long as hind basitarsus; anterodorsal surface with a series of fine, shorter bristles.....10. *pilosissima* Stein

At least the respective bristles mentioned above on hind tibia shorter than the above measurements; anterodorsal surface with at most only one or two accessory bristles in addition to the mid bristle.....11

11. Fore coxae largely or entirely black.....12
Fore coxae largely or entirely yellow.....20

12. Hind tibia largely blackish.....11. *geniculata* (Fallén)
Hind tibia largely yellow.....13

13. Ninth tergum (anal sclerite) noticeably protruded and globular in appearance, armed with 3 or 4 well developed bristles.....14

Ninth tergum not noticeably globular in appearance, closely conforming to the shape of the abdomen, armed with a weak pair of bristles at most.....15

14. Processes of fifth sternum with inner (ventral) margin concave in outline, when viewed in profile, the apical half tapering sharply to an angular point which is highly polished; fore coxae with a tuft of fine black bristly hairs at distal margin.....12. *lata* Walker

Processes of fifth sternum with inner (ventral) margin almost straight in outline when viewed in profile, the distal half broadly rounded, pruinescent, not tapering to a sharp prominence; fore coxae with a few bristles along distal margin.....13. *errans* Malloch

15. Processes of fifth sternum with a dense series of long fine erect bristles from base to apex, many of which are as long as the fifth sternum itself; sterna 2, 3, and 4 with a pair of long fine bristles, sternum 4 with abnormally long bristles caudad.....14. *rufibasis* Stein

Processes of fifth sternum with much longer bristles apicad than at base, or if the basal bristles are as long as those apicad then none of them are as long as the fifth sternum.....16

16. Fore tibia with apical posterodorsal bristle setulose; fifth abdominal tergum with a series of robust bristles along caudal margin.....15. *sexnotata* Meigen
Fore tibia with apical posterodorsal bristle well developed; fifth abdominal tergum with a series of weakly developed bristles along caudal margin.....17
17. Fore femur entirely yellow.....18
Fore femur largely infuscated.....19
18. Frons covered with a brassy sheen or pruinescence; hind basitarsus shorter than apical mid dorsal bristle on hind tibia; mid and hind femora with stout, strong bristles on posteroventral surface.....16. *flavifrons* Stein
Frons covered with whitish pruinescence; hind basitarsus longer than apical mid dorsal bristle on hind tibia; mid and hind femora with no proportionately strong bristles on posteroventral surface.....17. *dorsovittata* Malloch
19. Processes of fifth sternum about as long as average width; abdominal bristles strongly developed; hind tibia with apical mid dorsal and anterodorsal bristles situated on widely separated transverse planes.....18. *atrata* Walker
Processes of fifth sternum longer than average width; abdominal bristles weakly developed; hind tibia with apical mid dorsal and anterodorsal bristles approximated, situated on about the same transverse plane.
11. *geniculata* (Fallén)
20. Parafacial at base of antennae, when viewed in profile, as wide as distance between oral vibrissae (exclusive); cheeks higher than distance between vibrissae, fully equal at narrowest to half maximum breadth of eye.
19. *nudiseta* Stein
Parafacial at base of antennae not as wide as distance between oral vibrissae; cheeks not as high as distance between oral vibrissae, at narrowest less than half maximum breadth of eye.....21
21. Mid tibia with apical posteroventral bristle short, shorter than diameter of tibia where situated; if as long, then about equal in length to apical anteroventral bristle. (cf., 29. *frisoni*, 37. *pallipes*).....22
Mid tibia with apical posteroventral bristle long, longer than diameter of tibia where situated; if as long, then shorter than apical anteroventral bristle.....43
22. Head including proboscis and all antennal segments pale yellow, with the ocellar callosity and median section of the occipital region sometimes blackened; thorax entirely yellow, with or without a grayish black dorsocentral band along the mesonotum and metanotum..20. *modesta* Loew

Head and thorax largely blackish with grayish or whitish pruinescence.....23

23. All femora more or less suffused throughout distal half with brownish infuscation; fore, mid, and hind tibiae more or less brownish infuscated.....24

All femora and tibiae yellowish; or, if the femora are more or less infuscated, then the tibiae are entirely yellow...26

24. Frons entirely dense silvery pruinescent; eyes separated by a distance greater than maximum breadth of eye when viewed from in front; frons with one pair of parafrontal bristles, the paraorbitals setulose..21. *argentata* Coquillett

Frons with frontal vitta blackish; eyes separated by a distance not greater than maximum breadth of eye when viewed from in front; frons with two pairs of parafrontal bristles, the paraorbital pair bristlelike.....25

25. Abdomen densely pearlaceous pruinescent, with at most trace of blackish spots; thorax whitish pruinescent.
22. *fuscifrons* Malloch

Abdomen grayish drab, with trace of pruinescence; thorax concolorous with abdomen.....23. *anthracina* Malloch

26. Hind femur with some abnormally long bristles on anteroventral, anterodorsal, and posteroventral surfaces, nearly all of which are distinctly longer than those of abdomen, the longest equal to length of hind basitarsus; hind tibia with very long mid anterodorsal and apical mid dorsal bristles, which together equal the length of tibia.....27

Hind femur with bristles on anteroventral and anterodorsal surfaces not abnormally long, many of which not longer than those of abdomen; hind tibia with mid anterodorsal and mid apical dorsal bristles together shorter than length of hind tibia..... 28

27. Third antennal segment and palpi entirely yellow; pale grayish species with parafacials, cheeks, and face silvery pruinescent.....24. *argenticeps* Malloch

Third antennal segment infuscated in part, palpi largely fuscous, blackish; blackish species with parafacials, cheeks, and face grayish cinereous pruinescent.
25. *setigera* Malloch

28. Abdomen with basal segments broadly yellowish or whitish testaceous.....29

Abdomen with basal segments blackish, concolorous with thorax.....36

29. Fore, mid, and hind tibiae with no mid bristles.
26. *nudipes* Stein

Fore, mid, and hind tibiae with one or more mid bristles..30

30. Abdomen with dense pearlaceous pruinescence, unspotted, and with sparsely distributed setulae, the basal segments whitish in appearance.....31
Abdomen with basal segments reddish, the caudal segments more or less blackish, with paired spots more or less apparent, with normal covering of setulae.....32

31. Frons, including frontal vitta and ocellar triangle densely whitish pruinescent; thorax densely whitish pruinescent; tarsi yellowish, fifth segment blackish; ocellar bristles finely developed.....27. *nivea* Loew
Frontal vitta blackish, parafrontals and ocellar triangle cinereous pruinescent; mesonotum grayish black; humeral, and notopleural callosities, and pleura thinly dusted with whitish pruinescence; tarsi brownish black; ocellar bristles strongly developed.....28. *albibasis* Stein

32. Hind tibia with apical mid dorsal and anterodorsal bristles approximated, situated on about the same transverse plane; hind femur with 2 or 3 short bristles distad of the longish mid bristle on posteroventral surface..29. *frisoni* Malloch
Hind tibia with apical mid dorsal bristle situated on a plane distinctly basad of apical anterodorsal bristle; hind femur with no short bristles distad of longish mid bristle on posteroventral surface.....33

33. Third antennal segment largely brownish fuscous, yellowish basad; mesonotum with three vittae.
30. *nivea* var. *brunnescens* Malloch
Third antennal segment entirely yellowish; thorax with two vittae at most.....34

34. Mesonotum with fuscous vitta along the plane of each series of dorsocentral bristles; processes of fifth sternum broadly rounded, with a few short bristles and setulae on distal half.....31. *perspicua* new species
Mesonotum with no distinct vittae; fifth sternum deeply incised, processes elongate and bare on distal half.....35

35. Processes of fifth sternum fringed with a dense series of black hairs along the inner margin from base to apex.
32. *antennalis* Stein
Processes of fifth sternum with no series of setulae on inner margin.....33. *furtiva* new species

36. Hind femur with longest bristles on anteroventral surface situated basad, with two long fine bristles on median third of posteroventral surface; ninth tergum (anal sclerite) with a pair of weak bristles cephalad (dorsad), which are equal in length to bristles on caudal margin of fifth tergum; hind basitarsus short, not longer than apical mid dorsal bristle of hind tibia.....34. *bonita* new species

Hind femur with longest bristles on anteroventral surface situated distad, posteroventral surface with at most only one longish bristle on median third; ninth tergum (anal sclerite) with no noticeable pair of bristles cephalad (dorsad), if present, they are weaker in development than those on caudal margin of fifth tergum; hind basitarsus longer than the apical mid dorsal bristle of hind tibia. . 37

37. Third antennal segment entirely yellow; palpi testaceous, yellowish. . . . . 35. *oregonensis* Malloch

Third antennal segment and palpi fuscous or blackish, in part or entirely. 38

38. Hind tibia with apical mid dorsal and anterodorsal bristles approximated, situated on about the same transverse plane; mid femur with only one preapical bristle on posterior surface; abdominal bristles weak, not longer than those on basal sclerite of hypopygium. 39

Hind tibia with apical mid dorsal bristle situated on a plane distinctly basad of apical anterodorsal bristle; mid femur with 2 preapical bristles on posterior surface; many of the abdominal bristles fully as long as the bristles on basal sclerite of hypopygium. 40

39. Humeral callosity armed with stout stubby setulae; third antennal segment with no spinular process at apex of dorsal (upper) surface. . . . . 36. *armiger* new species

Humeral callosity clothed with normal setulae; third antennal segment with a spinular process at apex of dorsal (upper) surface. . . . . 37. *pallipes* Stein

40. Abdomen with three or more pairs of marks. 41

Abdomen with no trace of paired marks. 42

41. Abdominal marks brownish spots; propleural callosity at base of fore coxa with only one bristle; presutural pair of dorsocentral setulae setulose, as acrosticals; mid femur with weak bristles at base of anteroventral surface, not as long as width of femur where situated.

38. *incisurata* van der Wulp

Abdominal marks blackish and elongate; propleural callosity at base of fore coxa with a weak bristle in addition to a stronger bristle; presutural pair of dorsocentral setulae spinulose; mid femur with a longish bristle on proximal third of anteroventral surface, the bristle fully as long as width of femur where situated.

40. *maculiventris* new species

42. Third antennal segment yellowish at base; coxae and femora entirely yellow. . . . . 39. *candida* new species

Third antennal segment entirely blackish; mid and hind coxae suffused with grayish infuscation; femora more or less infuscated on distal half. . . . . 41. *impunctata* Malloch

43. Scutellum with apical pair of bristles absent or weakly developed; costa with a series of longish semierect setulae, the longest equal to length of *r–m* cross vein. 42. *pedella* (Fallén)

Scutellum with apical pair of bristles strongly developed, bristlelike 44

44. Mid and hind femora with a short preapical bristle on posteroventral surface; hind tibia with a well developed apical posterodorsal bristle 45

Mid and hind femora with no preapical bristle on posteroventral surface; hind tibia with apical posterodorsal bristle setulose 46

45. Third antennal segment entirely yellow; palpi yellow. 43. *compressa* Stein

Third antennal segment more or less fuscous, or entirely blackish; palpi brownish, or fuscous. 44. *compressa* var. *conforma* new variety

46. Basal segments of abdomen broadly reddish yellow; fifth abdominal sternum with processes elongate and bare on distal half, the inner margin fringed with a dense series of black setulae from base to apex. . . . 31. *antennalis* Stein

Basal segments of abdomen largely or entirely blackish; processes of fifth abdominal sternum with bristles or setulae on distal half 47

47. Hind tibia with a strong bristle at middle of posterodorsal surface 48

Hind tibia with no strong bristle at middle of posterodorsal surface 49

48. Large species, 4 mm or more; abdomen with paired spots; fore tibia with a distinctive anterodorsal bristle, with apical posterodorsal bristle weakly developed; mid and hind coxae largely yellow ..... 45. *triseta* Stein

Smaller species, 3 mm; abdomen with no paired spots; fore tibia with no bristle near middle of anterodorsal surface, with apical posterodorsal bristle well developed, bristlelike; mid and hind coxae largely grayish . . 46. *toshua* new species

49. Third antennal segment largely yellowish 50

Third antennal segment largely blackish 51

50. Hypopygium prominent; ninth tergum (anal sclerite) rufous, highly polished ventrad, with a pair of fine longish bristles cephalad (dorsad); processes of fifth sternum lying adjacent to one another, more or less in a vertical position to the abdomen, the ventral (inner) margin blackish, shining, somewhat swollen or thickened apicad, the distal (caudal) margin straight, giving the processes a broad truncated appearance ..... 34. *bonita* new species

Hypopygium secluded, not prominent; ninth tergum grayish black with a setulose pair of inconspicuous bristles; processes of fifth sternum more or less horizontal in position, inconspicuous and appressed to the ventral surface of abdomen, the inner margin reddish, not shining, the processes gradually tapered apicad.

47. *rubrina* new species

51. Processes of fifth sternum with a dense series of long, fine, erect bristles from base to apex, many of which are as long as the fifth sternum itself; sterna 2, 3, and 4 with a pair of long fine bristles, sternum 4 with abnormally long fine bristles caudad . . . . . 14. *rufibasis* Stein

Processes of fifth sternum with much longer bristles apicad than at base, or if the basal bristles are as long as those apicad, then none of them are as long as the fifth sternum 52

52. Abdomen unmarked; mid femur with a strong bristle on median third of anteroventral surface, which is longer than breadth of femur where situated; mid tibia with a strong bristle at middle of anterodorsal surface, which is longer than bristle at middle of posterior surface.

41. *impunctata* Malloch

Abdomen with more or less distinct spots; mid femur with bristle on median third of anteroventral surface not longer than breadth of femur where situated; mid tibia with at most a short bristle on anterodorsal surface, which is not longer than bristle at middle of posterior surface 53

53. Hind femur with bristles in anteroventral series becoming noticeably longer basad, the prebasal bristle longer than bristles in anterodorsal series; fore femur with middle series of bristles on posterior surface setulose, except for 2 or 3 bristles basad; coxae yellowish . 48. *johnsoni* Malloch

Hind femur with bristles in anteroventral series uniform in length, not longer or stronger basad, the prebasal bristle not longer than bristles in anterodorsal series; fore femur with a well developed series of bristles along the median plane of posterior surface; coxae suffused more or less with grayish infuscation . . . . . 15. *sexnotata* Meigen

Females

1. Fore, mid, and hind femora uniformly, and entirely blackish, occasional specimens with trace of yellowish streaks appearing thro the black 2

Mid and hind femora at least broadly yellowish on proximal half, occasional specimens with the yellowish area restricted to smaller proportions 12

2. Hind tibia with a well developed bristle at middle of posterodorsal surface, and with two longish bristles at apex on ventral surface, with apical posterodorsal bristle well developed, about equal in length to apical anterodorsal bristle.....1. *cilicauda* (Malloch)

   Hind tibia with no well developed bristle at middle of posterodorsal surface, and with one longish bristle at apex of ventral surface; with the apical posterodorsal bristle weakly developed, shorter than apical anterodorsal bristle.....3

3. Scutellum with apical bristles much weaker developed than the basal pair; mid femur with a preapical bristle on anterior surface; costa with a series of erect setulae on middle third, which are longer than breadth of costa.
   42. *pedella* (Fallén)

   Scutellum with apical bristles and basal bristles coequal in development; mid femur with no preapical bristle on anterior surface; costal setulae not longer than breadth of costa.....4

4. Halteres black, upper calyptrae with margins blackish.
   2. *effulgens* new species

   Halteres yellow, upper calyptrae with margins whitish or yellowish.....5

5. Hind tibia with apical mid dorsal bristle and apical anterodorsal bristle situated on about the same transverse plane, apical anterodorsal bristle very weak.....6

   Hind tibia with apical mid dorsal and apical anterodorsal bristles situated at markedly different transverse planes, the former bristle basad of the latter; apical anterodorsal bristle robust.....7

6. Humeral callosity with one or more stubby spinules; mesonotum with the presutural pair of dorsocentral setulae similarly spinular in character; posterior notopleural bristle short and stout; third antennal segment with no spinular process at apex of upper (dorsal) surface.
   36. *armiger* new species

   Humeral callosity with no such spinules; mesonotum with the presutural pair of dorsocentral setulae setulose, as acrosticals; posterior notopleural bristle normal in appearance; third antennal segment with a fine spinular process at apex of upper (dorsal) surface...4. *pygmaea* (Zetterstedt)

7. Fore tibia with apical posterodorsal and apical posteroventral bristles well developed, equal to apical mid dorsal bristle; mid tibia with a well developed apical posterodorsal bristle, and a weaker apical mid dorsal bristle.....8

   Fore tibia with apical posterodorsal bristle much weaker developed than apical mid dorsal bristle.....9

8. Tibiae largely fuscous or blackish.....7. *fraterna* Malloch
   Tibiae yellow.....8. *nigrescens* Stein
9. Frontal vitta when viewed from behind velvety black; parafrontals with seal brown infuscation; fore and mid tibiae fuscous or blackish.....23. *anthracina* Malloch
   Frontal vitta when viewed from behind not deep black; parafrontals grayish, with no seal brown infuscation; fore and mid tibiae yellowish.....10
10. Mid tibia with three well developed apical bristles on ventral surface, the bristle on posteroventral surface longish and well developed; apical posterodorsal bristle well developed, nearly equal in length to apical mid dorsal bristle; fore tibia with apical posteroventral bristle about equal in length to apical mid dorsal bristle; larger species, 4.5 mm
    6. *alticola* Malloch
    Mid tibia with one or two well developed apical bristles on ventral surface, the posteroventral bristle much shorter than mid ventral bristle; apical posterodorsal bristle setulose, much shorter than apical mid dorsal bristle; fore tibia with apical posteroventral bristle shorter and finer in development than apical mid dorsal bristle; smaller species, 3.5 mm.....11
11. Abdomen with paired brownish marks on terga 3 and 4; femora broadly yellowish at apices, the yellowish area of mid femur extending basad of preapical bristles on posterior surface; hind tibia occasionally with one or more short anterodorsal bristles basad of bristle at middle of anterodorsal surface.....5. *aliena* Malloch
    Abdomen with no paired marks on terga 3 and 4; femora narrowly yellowish at apices, the yellowish areas of mid femur not extending basad of preapical bristles on posterior surface.....41. *impunctata* Malloch
12. Cheek in profile as high as distance between oral vibrissae; parafacials at base of antennae about equal to one-third the diameter of eye at a level immediately caudad of parafacial measurement.....19. *nudiseta* Stein
    Cheek in profile not as high as distance between oral vibrissae; parafacial at base of antennae less than one-fourth as wide as diameter of eye at a level immediately caudad of parafacial measurement.....13
13. Hind tibia with the setulae on distal half of anterior and dorsal surfaces semierect and distinctly more robust and longer than those on proximal half, among which are one or more short accessory bristles; with two anteroventral bristles; mid tibia with apical anterodorsal bristle well developed.....9. *tausa* new species

Hind tibia with setulae on anterior and dorsal surfaces normally appressed throughout the distal and proximal halves, of uniform appearance; with no accessory bristles and with one anteroventral bristle; mid tibia with apical anterodorsal bristle weakly developed or setulose.....14

14. Third antennal segment with a fine spinular process at apex of upper (dorsal) surface; hind tibia with apical anterodorsal and apical mid dorsal bristles situated on about the same transverse plane.....37. *pallipes* Stein

Third antennal segment with no such spinular process at apex of upper (dorsal) surface.....15

15. Mid tibia with apical posteroventral bristle not longer than diameter of tibia where situated.....16

Mid tibia with apical posteroventral bristle robust and longish, longer than diameter of tibia where situated...25

16. Hind tibia with apical anterodorsal and mid dorsal bristles situated on nearly the same transverse plane.
37. *pallipes* Stein

Hind tibia with apical anterodorsal and mid dorsal bristles situated on markedly different transverse planes, the latter bristle is distinctly basad of the former.....17

17. Head, thorax, and abdomen largely yellowish, the head with ocellar triangle and occipital areas more or less grayish black, the thorax with a blackish dorsocentral vitta along mesonotum and metanotum; abdomen with trace of blackish areas, otherwise entirely yellow, including the palpi and antennae.....20. *modesta* Loew

Head, thorax, and abdomen largely if not entirely blackish.18

18. Third antennal segment yellowish at base, if slightly infuscated the fore femur is entirely yellow; abdomen with trace of yellowish testaceous at base, and conspicuously so on ventral aspect of abdomen.....19

Third antennal segment entirely black, if with trace of reddish yellow at base then the fore femur is blackish infuscated in part; abdomen entirely blackish.....20

19. Tarsi blackish; tergal bristles of abdomen weakly developed; cephalic pair of ocellar bristles stronger and longer than caudal pair, about equal in development to parafrontal bristles.....28. *albibasis* Stein

Tarsi yellowish; tergal bristles of abdomen well developed; cephalic pair of ocellar bristles finely developed, about equal to the caudal pair, and much weaker in development than parafrontal bristles.....27. *nivea* Loew

20. Mesonotum with presutural pair of dorsocentral setulae setulose in character, as acrosticals.
38. *incisurata* van der Wulp
Mesonotum with presutural pair of dorsocentral setulae stout and spinulose in appearance.....21

21. Frontal vitta and frontal triangle, viewed vertically from above, concolorous, densely grayish white or brownish pruinescent, if grayish white then the entire frons is densely grayish pruinescent; mid and hind tibiae frequently of a darker shade than the yellow of femora.
21. *argentata* Coquillett
Frontal vitta and frontal triangle viewed vertically from above not concolorous, the former blackish, the latter brownish pruinescent.....22

22. Mid and hind tibiae fuscous, darker in color than yellowish portion of femora; frontal vitta, viewed from in front, opaque black.....22. *fuscifrons* Malloch
Mid and hind tibiae yellow, concolorous with yellowish portion of femora; frontal vitta viewed from in front, with grayish or brownish pruinescence.....23

23. Fifth abdominal tergum with no distinct paired marks as on terga 3 and 4, the discal bristles set in brownish spots.
39. *candida* new species
Fifth abdominal tergum with distinctive paired spots as on terga 3 and 4.....24

24. Mid and hind femora broadly infuscated on distal half; fore femur narrowly yellowish on distal third, the yellowish area not extending to a level basad of distal bristle of posteroventral series.....10. *pilosissima* Stein
35. *oregonensis* Malloch
Mid and hind femora largely yellow on distal half; fore femur broadly yellowish on distal third, the yellowish area extending to a level basad of distal bristle of posteroventral series.....24. *argenticeps* Malloch

25. Fore coxae largely blackish.....26
Fore coxae largely yellowish.....32

26. Fore tibia with apical posterodorsal bristle weakly developed, setulose, shorter than apical mid dorsal bristle.....27
Fore tibia with apical posterodorsal bristle well developed, about as long as apical mid dorsal bristle.....29

27. Mid femur with a preapical bristle on anterior surface...28
Mid femur with no preapical bristle on anterior surface.
15. *sexnotata* Meigen

28. Abdominal discal bristles well developed, longer than length of respective terga; abdomen with paired spots. 14. *rufibasis* Stein

Abdominal discal bristles weakly developed, not as long as length of respective terga; abdomen with no spots. 17. *dorsovittata* Malloch

29. Hind tibia with apical anterodorsal and mid dorsal bristles situated at about the same transverse plane, the distance between which not greater than twice diameter of trichopore 30

Hind tibia with apical anterodorsal and mid dorsal bristles situated at distinctly different levels, the distance between which greater than twice diameter of trichopore. 18. *atrata* Walker

30. Hind tarsus shorter than hind tibia; hind basitarsus slightly shorter than length of apical mid dorsal bristle on hind tibia; mid tibia with apical mid dorsal bristle as long as diameter of tibia where situated; cephalic pair of ocellar bristles well developed 31

Hind tarsus as long as hind tibia; hind basitarsus as long as apical mid dorsal bristle on hind tibia; mid tibia with apical mid dorsal bristle shorter than diameter of tibia where situated; cephalic pair of ocellar bristles finely developed . . . . . 13. *errans* Malloch

31. Fore femur entirely blackish; tarsi blackish; abdomen with brownish spots on terga 3 and 4; frontal vitta, viewed vertically from above, blackish; frontal triangle brownish pruinescent . . . . . 12. *lata* Walker

Fore femur entirely yellow; tarsi yellow; abdomen with at most faint traces of spots on terga 3 and 4; frontal vitta and frontal triangle, viewed vertically from above, concolorous, with a dense brassy sheen or pruinescence. 16. *flavifrons* Stein

32. Hind tibia with apical anterodorsal and mid dorsal bristles situated on about the same transverse plane, the planes separated by not more than diameter of trichopore 33

Hind tibia with apical anterodorsal and mid dorsal bristles situated on markedly different planes, the latter bristle distinctly basad of the former 35

33. Hind tibia with a strong bristle at middle of posterodorsal surface, which is at least as long as bristle at middle of anteroventral surface; fore tibia with a well developed bristle near middle of anterodorsal surface. 45. *triseta* Stein

Hind tibia with or without a bristle at middle of posterodorsal surface, if present the bristle is shorter than bristle

at middle of anteroventral surface; fore tibia with no bristle near middle of anterodorsal surface.....34

34. Mid and hind coxae largely yellowish; abdomen with three pairs of marks; mesopleural series of bristles with at least two well developed bristles.....29. *frisoni* Malloch

Mid and hind coxae largely blackish; abdomen unspotted; mesopleural series of bristles with only one well developed bristle, the predorsal.....46. *toshua* new species

35. Hind tibia with a conspicuous weak bristle at middle of posterodorsal surface and toward apex of posterodorsal surface; mid or hind femora, or both, with a weak preapical bristle on posteroventral surface.....36

Hind tibia with no conspicuous weak bristle at middle of posterodorsal surface, nor toward apex of posterodorsal surface; mid and hind femora with no weak preapical bristle on posteroventral surface.....37

36. Palpi yellowish or fuscous; abdomen with trace of yellowish at least; third antennal segment largely yellowish.
43. *compressa* Stein

Palpi and abdomen entirely black; third antennal segment largely blackish..44. *compressa* var. *conforma* new variety

37. Abdomen with trace of yellowish basad and ventrad, if blackish the terga show spots.....38

Abdomen entirely blackish, if with trace of yellowish testaceous the terga are unspotted.....39

38. Fore tibia with apical posterodorsal bristle strongly developed; palpi pale, yellowish; anterior pair of ocellar bristles stoutly developed; cheeks as high as width of third antennal segment.....33. *furtiva* new species

Fore tibia with apical posterodorsal bristle weakly developed; anterior pair of ocellar bristles finely developed; cheeks not as high as width of third antennal segment; palpi brownish.
27. *nivea* Loew
30. *nivea* var. *brunnescens* Malloch

39. Mid femur with a preapical bristle on anterior surface; abdomen with well developed discal bristles on terga, stronger developed than marginal bristles.....40

Mid femur with no preapical bristle on anterior surface; tergal bristles weakly developed, barely longer than marginal bristles; lower calyptrae smallish.
48. *johnsoni* Malloch

40. Abdomen with an interrupted dorsocentral vitta between the brownish spots; third antennal segment reddish at base.
34. *bonita* new species

Abdomen with no dorsocentral vitta; third antennal segment entirely blackish.....14. *rufibasis* Stein

1. Coenosia (Limosia) cilicauda Malloch (Figs. 1, 27, 66)

Coenosia cilicauda Malloch, Ent. News, xxxi, p. 104, 1920. Frison, Bull. Ill. Nat. Hist. Surv., xvi, p. 197, 1927.

Macrocoenosia cilicauda Malloch, Ent. News, xxxii, p. 205, 1921.

In the series studied of this species all the coxae, trochanters, and femora, with the exception in the latter case of a narrow apical area, are entirely blackish. In the male the first four tarsal segments are more or less tinged with yellow, the fifth segment being entirely blackish; the hypopygium resembles that of *lata* Walker in being prominent, the ninth tergum being globose in appearance, the anal cleft reduced in area, and the cerci and gonostyli (superior and inferior forceps) elongate and slender. However in the male of *lata* the ninth tergum possesses strong bristles, whereas in *cilicauda* these bristles are much weaker. The female of *cilicauda* may be readily recognised by the fringe of dense black spinular bristles along the caudal margin of fifth tergum, resembling in this respect the European species *Rhyncocoenops obscuricula* Rondani.

In both sexes the apical bristles on the dorsal surface of each tibia are well developed, and the hind tibia has two apical bristles on the ventral surface, and a strong apical posterodorsal bristle.

The species is referred to the genus *Macrocoenosia* by Malloch (18), on account of the presence of a strong bristle at middle of posterodorsal surface of hind tibia.

Alberta: 1 ♂, Lethbridge, June 10, 1923, (H. L. Seamans); 1 ♀, May 24, 1923, (Walter Carter). 1 ♂, Brooks, June 8, 1923, (Walter Carter). 1 ♀, Banff, Sept. 11, 1922, (C. B. D. Garrett). 1 ♀, Waterton, June 19, 1923, (H. L. Seamans). 1 ♀, Medicine Hat, May 16, 1926, (F. S. Carr). 1 ♀, Chin, May 30, 1923, [all C.N.C.].

British Columbia: 1 ♀, Oliver, May 2, 1923. 1 ♀, Osoyoos, May 18, 1923, (C. B. D. Garrett). 1 ♀, Cranbrook, June 3, 1926, (A. A. Dennys), [all C.N.C.].

Manitoba: 1 ♂, Aweme, May 23, 1923, (R. M. White). 1 ♂, Strathclair, Aug. 8, 1923, (H. A. Robertson). 1 ♂, Winnipeg, June 19, 1927, (H. J. Brodie). 1 ♀, Teulon, July 7, 1923, (A. J. Hunter). 1 ♀, Baldur, June 13, 1925, (N. Criddle), [all C.N.C.].

Montana: 1 ♂, Monida, June 27, 1913. 1 ♂, Lima, July 1, 1913. 1 ♀, Sidney, June 14, 1923. 1 ♀, Bozeman, Sept. 2, 1915, [all Mont. Agr. Exp. Sta.].

Quebec: 1 ♀, Knowlton, July 21–22, 1927, (W. J. Brown), [C.N.C.].

Saskatchewan: 1 ♂, Saskatoon, Aug. 9, 1923, (K. M. King). 1 ♀, Lacadena, July 4, 1923, (K. M. King), [all C.N.C.].

WASHINGTON: 1 ♂, Lind, July 1919, (F. W. Carlson). 1 ♂, Ritzville, June 12, 1920. 1 ♀, Lake Paha, July 20, 1920, (R. C. Shannon), [H.C.H.].

2. Coenosia (Limosia) effulgens new species

The species may be readily recognised by its sooty black coloration, which includes the legs and halteres, and, in the male, the calyptrae. The wings are noticeably infuscated. In structure the species undoubtedly belongs to the *fuscifrons* group.

Male entirely black, including legs, calyptrae, and halteres; head densely black, especially the frons. Abdomen with no spots apparent. Wings with veins blackish brown, the membrane smoky.

Head with eyes separated by a distance equal to one-third maximum width of head when viewed from above; parafrontals with two pairs of longish parafrontal bristles, between which is a shorter third pair of bristles; cephalic pair of ocellar bristles strongly developed; third antennal segment about 1.5 times length of second segment; cheeks slightly higher than width of third antennal segment; marginal bristles along ventral border of head well developed.

Bristles composing the discal and marginal series on abdominal terga equally short and fine.

Legs slender, the tarsi conspicuously longer than their respective tibiae. Fore tibia with a fine bristle at middle of posterior surface, and at apex of dorsal surface, the apical posteroventral bristle setulose, weakly developed. Mid femur with a fine longish bristle on proximal third of anteroventral and posteroventral surfaces, the former bristle slightly shorter than the latter. Mid tibia with bristle at middle of anterior and posterior surfaces, the former slightly longer and situated slightly distad of the latter; apical posteroventral bristle minute. Hind femur with a series of longish bristles on anteroventral and anterodorsal surfaces; hind tibia with a mid anteroventral and anterodorsal bristle, the apical bristles on dorsum not approximated.

Length, 3 mm.

Female similar to male, the thorax and abdomen paler, the calyptrae brownish. Fore tibia with a well developed apical posteroventral bristle; mid tibia with a short apical posteroventral bristle, not longer than diameter of tibia where situated; hind femur with normal series of bristles.

Length, 3.5 mm.

Type.—♂; Alta Meadow, Seq. Nat. Park, California, July 19, 1907, 9000 ft., (J. C. Bradley) [U.S.N.M.]. *Allotype.*—♀; same locality and date, [U.S.N.M.].

Paratype.—1 ♀; Mt. Adams, Washington, July 24, 1921, (A. L. Melander) [A.L.M.].

3. **Coenosia (Limosia) nigricoxa** Stein

Coenosia nigricoxa Stein, Arch. f. Naturgesch., LXXXIV, (1918), A, hft. 9, p. 99, 1920. Malloch, Ent. News, XXXII, p. 205, 1921.

This species has so far been recognised in the male sex only. As in *cilicauda*, the coxae and femora, with the exception of the yellowish apical areas on the latter, are entirely blackish. The fore tarsi are strikingly yellow except for the blackish fifth segment. In addition the mid tarsi are also yellowish except for the fifth segment, in contrast to the blackish hind tarsi; the fore and mid tibiae are entirely yellowish, in contrast to the blackish infuscated hind tibia. The hind femur has a preapical posteroventral bristle and a preapical posterior bristle. The apical mid dorsal and anterodorsal bristles of hind tibia are closely approximated, being situated on about the same transverse plane, and the mid femur has only one preapical bristle on posterior surface.

ALBERTA, 1 ♂, Banff, June 21, 1922, (C. B. D. Garrett), [C.N.C.].

4. **Coenosia (Limosia) pygmaea** (Zetterstedt)

Anthomyza pygmaea Zetterstedt, Dipt. Scand., IV, p. 1721, 1845.
Coenosia pygmaea Meade, Ent. Month. Mag., XIV, p. 252, 1878.
Coenosia geniculata pygmaea Strobl, Verh. zool.-bot. Ges. Wien, XLIII, p. 268, 1893.
Centriocera pygmaea Pokorny, Verh. zool.-bot. Ges. Wien, XLIII, p. 538, 1893.
Coenosia (Palusia) pygmaea Schnabl and Dziedzicki, Abh. K. Leop.-Carol. Deutsch. Akad. Naturforsch., XCV, Nr. 2, p. 76, 1911.

The species resembles *pallipes* Stein in structure, possessing the peculiar spinular process at apex of dorsal (upper) surface of third antennal segment, and the same chaetotaxy on the legs and abdomen. The species differs from *pallipes* in possessing paired brownish spots on abdominal terga, in having all the femora largely blackened, and the fore and hind tibiae largely infuscated throughout the distal two-thirds.

ALBERTA: 1 ♂, 1 ♀, Banff, June 21, 1922, (C. B. D. Garrett), [C.N.C.].
BRITISH COLUMBIA: 1 ♀, Osoyoos, May 18, 1923, (C. B. D. Garrett), [C.N.C.].

COLORADO: 1 ♀, Tennessee Pass, July 24, 1917, (J. M. Aldrich). 1 ♀, John Smith Ranger Station, Cochetopa, N. F., July 3, 1913, (A. K. Fisher), [all U.S.N.M.].

WYOMING: 1 ♂, Roosevelt Station, Yellowstone Park, July 5, 1923. 1 ♀, Swan Lake, Yellowstone Park, July 10, 1923, (A. L. Melander), [all A.L.M.].

5. Coenosia (Limosia) aliena Malloch (Figs. 8, 36, 63)

Coenosia aliena Malloch, Ent. News, XXXII, pp. 134 and 204, 1921. Frison, Bull. Ill. Nat. Hist. Surv., XVI, p. 197, 1927.

The species closely resembles *C. nigrescens* and *C. alticola*. From *nigrescens* the species may be distinguished by the lack of a preapical bristle on anterior surface of mid femur, and by the weaker development of apical posterodorsal bristle on fore tibia, the latter bristle being no longer than width of tibia where situated. In addition the abdomen is more highly shining, the abdominal bristles not so strongly developed, and the apical region of all femora more broadly yellowish.

From *alticola* the species may be distinguished in the male sex by the shorter and broader processes, which closely resemble those of *nigrescens*, the more secluded hypopygium, and weaker abdominal bristles; and in the female sex by the shorter development of apical posteroventral bristle on fore and mid tibiae, and of the apical posterodorsal bristle on mid tibia. The presence of one or more short anterodorsal bristles proximad of the mid anterodorsal bristle on hind tibia is variable. When present this character serves to readily distinguish this species from closely related forms.

BRITISH COLUMBIA: 1 ♀, Oliver, Sept. 10, 1923. 1 ♀, Keremeos, June 17, 1923, (C. B. D. Garrett). 1 ♀, Vernon, May 2, 1927, (I. J. Ward), [all C.N.C.]. 1 ♀, Carbonate to Prairie Hills, July 12–18, 1908, (J. C. Bradley), [C.U.].

CALIFORNIA: 1 ♂, Berkeley, Sept. 16, 1906. 1 ♀, Felton, Santa Cruz Mts., May 15–19, 1907, 300–500 ft. 1 ♀, Siberian Outpost, Tulare Co., July 31, 1915, (J. C. Bradley), [all C.U.].

COLORADO: 1 ♀, Berthona Pass, Sept. 1926, (T. D. A. Cockerell), [U.S.N.M.].

IDAHO: 1 ♀, Moscow Mt., Sept. 10, 1922. 1 ♀, Priest Lake, Lookout Mt., Aug. 20, 1919, (A. L. Melander), [all A.L.M.].

MONTANA: 1 ♀, Bozeman, June 3, 1916; 2 ♀, June 23, 1916, [Mont. Agr. Exp. Sta.].

OREGON: 1 ♀, Anthony Lake, Blue Mts., 7100 ft., Aug. 7, 1929, (H. A. Scullen), [Ore. Agr. Col.].

WASHINGTON: 1 ♀, Ilwaco, June 21, 1916, (A. Spuler), [Wash. State Col.]. 1 ♀, Pullman, Aug. 10, 1910. 1 ♀, Ararat Mt., Mt. Rainier, Aug. 7, 1922. 1 ♀, Longmire Spring, Mt. Rainier, Aug. 15, 1922. 1 ♀, Mazama Ridge, Mt. Rainier, July 23, 1922. 1 ♀, Orcas Island, above Mt. Lake, Mt. Rainier, Aug. 18, 1925. 1 ♀, Lake Chelan, Stehekin, July 30, 1919, (A. L. Melander), [all A.L.M.].

WYOMING: 1 ♀, Canyon Camp, Yellowstone Park, Aug. 27, 1915, 7700 ft., (A. L. Melander), [A.L.M.].

6. **Coenosia (Limosia) alticola** Malloch

Coenosia alticola Malloch, Proc. Cal. Acad. Sci., IX, (ser. 4), p. 303, 1919. Malloch, Ent. News, XXXII, p. 205, 1921.

The species resembles *nigrescens* in general structure and coloration, having the coxae entirely, the femora largely or entirely blackish, and all the tibiae entirely yellowish. In *alticola* the fore tibia has the apical posterodorsal bristle setulose, weakly developed, whereas in *nigrescens* this bristle is noticeably well developed.

CALIFORNIA: 1 ♂, Echo Lake, Shasta Range, Aug. 29, (A. Kusche), [A.N.S.P.].

OREGON: 1 ♀, Hood River, (Childs). 1 ♀, Horseshoe Lake, Blue Mts., 7500 ft., July 26, 1929, (H. A. Scullen), [all Ore. Agr. Col.].

UTAH: 1 ♀, Emigration Canyon, July 21, 1917.

7. **Coenosia (Limosia) fraterna** Malloch (Figs. 6, 33, 62)

Coenosia fraterna Malloch, Trans. Amer. Ent. Soc., XLIV, p. 282, 1918. Malloch, Ent. News, XXXII, p. 205, 1921. Frison, Bull. Ill. Nat. Hist. Surv., XVI, p. 198, 1927.

The species closely resembles *Coenosia nigrescens* Stein in structure, differing in that the tibiae are largely blackish infuscated and not yellowish.

CALIFORNIA: 1 ♂, Ross, April 28, 1918. 1 ♂, Alta Meadow, Sequoia. National Park, July 19, 1907, 9000 ft. 1 ♂, 1 ♀, Berkeley Hills, Sept. 9, 1907, 500–1000 ft., (J. C. Bradley), [all C.U.]. 1 ♀, Laws, Nov. 15, 1914, (A. Wetmore), [U.S.N.M.]. 1 ♂, 1 ♀, Castle Lake, Shasta Range, Aug. 26, 1911. 1 ♀, Upper McCloud River, Shasta Range, Aug. 31, 1911. 1 ♀, Echo Lake. Shasta Range, Aug. 29, 1911, (A. Kusche), [all A.N.S.P.].

COLORADO: 1 ♀, Tennessee Pass, 10240 ft., July 1912, (J. M. Aldrich), U.S.N.M.].

IDAHO: 1 ♂, Chatcolet, Aug. 15, (A. L. Melander). 1 ♀, Moscow, June 6, 1912 [U.S.N.M.].

MONTANA: 1 ♂, Warm Springs, June 13, 1916.

NEW MEXICO: 1 ♀, Las Cruces, June 15, 1917, (J. M. Aldrich), [U.S.N.M.].

OREGON: 1 ♀, Hood River, (Childs). 1 ♂, Narrows, July 1, 1906. 1 ♀, Blitzen River, July 6, 1906, [all Ore. Agr. Col.].

Saskatchewan, 1 ♀, Bestville, July 5, 1923, (K. M. King), [C.N.C.].
Texas: 1 ♀, El Paso, July 23, 1911, (J. C. Bradley), [C.U.].
Utah: 1 ♀, Logan, Aug., (F. Marlatt), [U.S.N.M.].

8. **Coenosia (Limosia) nigrescens** Stein

Coenosia nigrescens Stein, Arch. f. Naturgesch., lxxxiv, (1918), A, hft. 9, pp. 98, 99, 1920. Johnson, Occ. Pap. Boston Soc. Nat. Hist., vii, p. 238, 1925. Johnson, Insect Fauna, Biol. Surv. Mt. Desert Region, p. 211, 1927. Huckett, Mem. 101 N. Y. (Cornell) Agr. Exp. Statn., (1926), p. 835, 1928.

This species I have recognised as distinct from *atrata* Walker, although in many respects it might be regarded as nothing more than a variety. Superficially the two species may be separated by the coloration of mid and hind femora; in *atrata* they are largely yellow proximad, whereas in *nigrescens* they are largely blackish.

British Columbia: 2 ♀, Agassiz, July 29, 1926, (H. H. Ross). 1 ♀, Osoyoos, May 19, 1923, (C. B. D. Garrett), [all C.N.C.]. 1 ♂, Downie Creek, Selkirk Mts., Aug. 9, 1905, (J. C. Bradley), [C.U.].

Colorado: 1 ♂, Tennessee Pass, 10240 ft., July 7, (J. M. Aldrich), U.S.N.M.].

Iowa: 1 ♀, Ames, May 29, 1928, (G. Hendrickson), [H.C.H.].

Manitoba: 1 ♀, Teulon, July 7, 1923, (A. J. Hunter), [C.N.C.].

Massachusetts: 3 ♂, 1 ♀, "N. Andover Col.," July 31, 1910. 1 ♀, Petersham, July 30, 1931; 1 ♂, July 1926, (A. L. Melander), [A.L.M.].

Minnesota: 1 ♂, Duluth, St. Louis County, Aug. 6–8, 1912, (Witmer Stone), [A.N.S.P.].

Wyoming: 4 ♂, Spring Creek, Yellowstone Park, July 15, 1923. 1 ♂, Old Faithful, Yellowstone Park, July 14, 1923, (A. L. Melander), [all A.L.M.].

New Brunswick: 1 ♀, Hillsboro, Aug. 8, 1913. 1 ♂, 1 ♀, Barberd, June 25, 1919. 1 ♂, 1 ♀, Gornish, July 11, 1913. 1 ♀, Oromocto, July 9, 1913. 1 ♂, 1 ♀, Fredrickton, Aug. 5, 1913. 1 ♀, Harvey, June 27, 1914, (F. M. McKenzie), [all C.N.C.].

New York: 1 ♂, Lake Placid, July 28, 1929, (A. L. Melander), [A.L.M.]. 1 ♀, Essex County, Lot 149, June 1916. 1 ♂, 1 ♀, Ringwood, Ithaca, June 14, 1920; 1 ♀, July 13, 1920; 1 ♀, June 26, 1920; 1 ♂, Oct. 11, 1920, (M. D. Leonard). 1 ♂, McLean Bogs, Tompkins County, Aug. 8, 1921; 1 ♀, May 31, 1913; 1 ♂, Aug. 18, 1928. 1 ♀, Ithaca, May 24, 1913; 1 ♂, 19–. 2 ♀, Wilmington, Essex County, Aug. 20–25, 1916, 1000–2200 ft. 1 ♀, Top Mt. Marcy, Aug. 28. 2 ♀, Mud Creek, Tompkins County, June 17–20, 1904. 1 ♂, Caroline-Harford, June 15, 1904. 1 ♀, Dryden Lake, Tompkins County, June 16, 1904. 1 ♀, Mt. MacIntyre, summit, Aug. 29, 1922, (Shannon & Sibley). 1 ♀, Montauk Point, Long Island, Sept. 4, 1927, [H.C.H.].

North Dakota: 1 ♂, Fargo, June 13, 1918, [H.C.H.].

Nova Scotia: 1 ♂, Kentville, July 8, 1923, (R. O. Gorham). 1 ♂, 1 ♀, Annapolis Royal, Sept. 15, 1929, (N. A. Patterson). 1 ♂, 1 ♀, Bridgetown, Aug. 29, 1912, (G. E. Sanders). 1 ♀, Truro, Aug. 9, 1919, [all C.N.C.].

ONTARIO: 1 ♂, 1 ♀, Norway Point, Lake of Bays, July 31, 1919, (J) McDunnough). 1 ♀, Mer Bleue, Ottawa, (W. Metcalfe). 1 ♀, Brockville, Sept. 20, 1903, (W. Metcalfe). 1 ♀, Lake Abitibi, Low Bush, July 29, 1925, (N. K. Bigelow). 1 ♀, Sand Lake, June 28, 1926, (F. P. Ide). 1 ♂, 1 ♀, Waubamick, June 1915, (H. S. Parish), [all C.N.C.].

PENNSYLVANIA: 1 ♂, 1 ♀, Lopez, Sullivan Co., Aug. 4–15, 1913, (Witmer Stone), [A.N.S.P.].

QUEBEC: 1 ♂, 1 ♀, Chelsea, June 20–25, 1916. 1 ♀, Mer Bleue, June 22, 1916. 1 ♀, Hemmingford, Aug. 29, 1916, (J. I. Beaulne); 2 ♀, Sept. 23, 1924, (G. H. Hammond). 1 ♂, Oka, May 24, 1921, (J. Ouellet). 1 ♀, Rigaud, June 25, 1906, (Beaulieu). 1 ♀, Coaticook, Sept. 10, 1913. 2 ♀, Ft. Coulonge, July 5, 1917, (J. I. Beaulne). 1 ♀, Covey Hill, June 27, 1927, (W. J. Brown), [all C.N.C.].

WASHINGTON: 1 ♀, Lake Paha, July 20, 1920, (R. C. Shannon). 1 ♀, Ringold, July 4, 1919, (F. W. Carlson). 1 ♂, Yakima, July 18, 1920, (A. L. Melander), [H.C.H.].

There are a number of female specimens in the above series which show a marked variation in the degree of infuscation present on mid and hind femora, but, so far, I have failed to find this so in the males of *nigrescens*.

9. **Coenosia (Limosia) tausa** new species (Figs. 15, 31, 77)

The male of this species may be separated from its closest allies by the peculiar chaetotaxy of the legs, notably in the absence of mid posterior bristle on fore tibia, the bristleless character of fore, mid, and hind femora, and the abundance of erect setulose bristles on anterior and dorsal surfaces of hind tibia. It differs essentially from those species having long bristles on hind tibia, e.g., *pilosissima*, *argenticeps*, through the possession of a strongly developed apical posteroventral bristle on mid tibia. The female likewise is readily recognised by the peculiar bristling of the hind tibia, though not so striking as in the male. In addition the chaetotaxy of the fore and mid legs is much more nearly normal than in the male.

Male pale grayish; face, parafacials, and cheeks whitish pruinescent; parafrontals grayish; frontal vitta fuscous, with trace of reddish, blackish laterad; third antennal segment entirely yellowish, second segment brownish, paler along distal margin; arista brownish black; palpi entirely yellow; proboscis dark brown, polished, labellum pale. Thorax and abdomen pale grayish pruinescent; scutellum concolorous; mesonotum with or without three narrow brownish vittae; abdominal terga 3 to 5, each with a pair of large brownish elongate marks; terga 1+2 with two smaller brownish spots; hypopygium with basal sclerite grayish pruinescent; ninth tergum (anal sclerite) and processes of fifth sternum more or less

yellowish. Wings clear, veins yellowish brown; halteres yellow; calyptrae whitish. Legs yellow, mid and hind pair of coxae and fifth tarsal segments occasionally with trace of fuscous.

Frons less than one-third width of head; two pairs of parafrontal bristles, equal in development to oral vibrissae, paraorbitals equal to length of cephalic pair of ocellar bristles; cheeks with bristles on ventral border short and sparsely distributed. Third antennal segment equal to twice length of second segment, extending for about two-thirds length of face, not reaching a level with ventral margin of eye; cheeks equal in height to about breadth of third antennal segment; arista minutely pubescent. Mesonotum with acrosticals irregularly paired, each series closely adjacent to one another.

Abdomen with strongly developed discal bristles; tergum 5 with a series of 4 or 5 strong marginal bristles; abdominal marks on terga 3 and 4 extending from caudal margin of each tergum cephalad to within a short distance of cephalic margin; fifth sternum deeply cleft, with two fine bristles apicad and a series of fine longish setulae along inner margin.

Fore femur with a very few, if any, setulae on ventral half of posterior surface, with at most only 1 or 2 weak bristles on proximal third of posterior and posteroventral surfaces; fore tibia with no mid posterior bristle, with the apical posterodorsal bristle weakly developed; mid femur with only 1 or 2 weak bristles on proximal third of posteroventral surface; mid tibia with a mid anterior and posterodorsal bristle, the former more robust and longer, situated decidedly distad of the latter bristle, with long apical anterodorsal and mid dorsal bristles, the apical posterodorsal bristle well developed but much shorter than the latter two bristles, apical posteroventral bristle longer than diameter of tibia where situated; hind femur with only 1 or 2 short weak bristles on proximal third of anteroventral and posteroventral surface, with a fine mid bristle on posteroventral surface; hind tibia clothed with numerous long fine setulose bristles on distal three-quarters of anterior and dorsal surfaces, with 2 long fine anteroventral bristles, with the mid anterodorsal and apical mid dorsal and anterodorsal bristles long and finely developed; hind tarsal segments 1, 2, and 3 with a fringe of longish setulae on dorsal surface.

Length, 3.5 mm.

Female similar to male; third antennal segment largely tinged, yellowish at base; frontal vitta darkened; palpi brownish. Fifth tergum with indistinct markings, occasionally with a brownish dorsocentral vitta. Tarsi fuscous. Margins of calyptrae with trace of brownish. Fifth abdominal tergum with marginal bristles weakly developed, as are those on other terga. Cheeks barely as high as width of third antennal segment.

Fore femur with 2 or 3 short bristles comprising the posterodorsal and posterior series, with a series of 4 or 5 widely spaced, well developed posteroventral bristles; fore tibia with a mid posterior bristle; mid femur with a stout bristle at middle of anterior surface, and with 2 or 3 short bristles on proximal third of anteroventral surface, with the normal preapical bristles on posterior surface, and with 3 or 4 bristles on proximal half of posteroventral surface; mid tibia as in male; hind femur with normal bristling, with 4 or 5 anteroventral bristles, and with a series of 3 or 4 bristles on proximal two-thirds of posteroventral surface; hind tibia as in male, but the bristles and setulae are not so long, the latter not so numerous; hind tarsi with no fringe of longish hairs on dorsal surface.

Length, 4 mm.

TYPE.—♂; Friday Harbor, June 27, 1928, Washington. [U.S.N.M.].

Allotype.—♀, same locality, June 29, 1928, (M. Shackleford).

10. **Coenosia (Limosia) pilosissima** Stein (Figs. 21, 47, 55)

Coenosia pilosissima Stein, Arch. f. Naturgesch., LXXXIV, (1918) A, hft. 9, pp. 100–101, 1920, (May).

Coenosia longispinosa Malloch, Trans. Amer. Ent. Soc., XLVI, p. 166, 1920, (June). Malloch, Ent. News, XXXII, p. 201, 1921.

The species evidently belongs to the *fuscifrons* group, which, I consider, includes such species as *argentata, anthracina, argenticeps, setigera,* and *oregonensis.* The male may be readily recognised on account of the exceptionally long fine curling bristles and setulae on femora and tibiae; in the female the legs are clothed with normal bristles, and I am unable to distinguish the same from females of *oregonensis.*

BRITISH COLUMBIA: 1 ♂, Victoria, May 6, 1919, (W. Downes). 1 ♂, St. Mary's, July 12, 1926. 1 ♀, Invermere, July 23, 1926, (A. A. Dennys). 1 ♀, Agassiz, Sept. 7, 1926, (H. H. Ross), [all C.N.C.].

CALIFORNIA: 1 ♂, Wild Cat Canyon, San Pablo, Centra Costa County, Oct. 16, 1906, (J. C. Bradley), [C.U.].

IDAHO: 1 ♂, Moscow Mt., Aug. 20, 1923, (A. L. Melander), [A.L.M.].

MONTANA: 1 ♂, Gallatin County, Aug. 8, 1913, 5500 ft. alt., [Mont. Agr. Exp. Sta.].

WYOMING: 1 ♂, Mystic Lake, July 24, 1902. 1 ♂, Thompson, Aug. 25, 1918. 1 ♂, Cascade Firehole River, Yellowstone Park, Aug. 5, 1918. 1 ♂, 1 ♀, Riverside, Yellowstone Park, Aug. 4, 1918. 1 ♂, Canyon Camp, Yellowstone Park, Aug. 12, 1918. 1 ♂, Riverside, Madison River, Yellowstone Park, Aug. 4, 1918. 1 ♂, Upper Geyser Basin, Yellowstone Park, Aug. 7, 1918, (A. L. Melander), [all A.L.M.].

OREGON: 1 ♂, Enterprise, July 28, 1929, 3750 ft. alt., (H. A. Scullen), [Ore. Agr. Col.].

WASHINGTON: 1 ♂, Ilwaco, June 18, 1918, (A. Spuler). 1 ♂, Ilwaco, July 1918, (O. E. Miner). 1 ♂, Pullman, May 15, 1925, (V. Argo), [all Wash. State Col.]. 1 ♀, Ritzville, Aug. 25, 1920, (R. C. Shannon), [H.C.H.]. 1 ♂, Pullman, May 13, 1923. 1 ♂, above Mt. Lake, Orcas Island, Aug. 18, 1925. 1 ♂, Valleyford, May 17, 1924. 1 ♂, Mt. Adams, July 24, 1921. 1 ♂ Knightmere, Aug. 9, 1919. 1 ♂, Lake Crescent, Piedmont, July 28, 1917, (A. L. Melander), [all A.L.M.].

11. **Coenosia (Limosia) geniculata** (Fallén)

Musca geniculata Fallén, Dipt. Suec., Muscides, p. 89, 1825.
Coenosia geniculata Meigen, Syst. Beschr., v, p. 219, 1826.
?Limosia alismatis Robineau-Desvoidy, Essai Myod., p. 540, 1830.
?Limosia hydrocotilis Robineau-Desvoidy, Essai Myod., p. 540, 1830.
Palusia femoralis Robineau-Desvoidy, Essai Myod., p. 545, 1830.
?Coenosia hydrocotilis Macquart, Hist. Nat. d. Ins., II, p. 349, 1835.
Anthomyza geniculata Zetterstedt, Ins. Lapp., p. 694, 1840.
Centriocera geniculata Pokorny, Verh. zool.-bot. Ges. Wien, XLIII, p. 537, 1893.
Coenosia (Palusia) geniculata Schnabl, Deutsch. Ent. Zeitschr., (6) p. 65, 1911.

The species *geniculata* superficially resembles *C. atrata* Walker (*lata* of authors) in the coloration of the femora, but differs in having the hind tibiae more or less infuscated, as in *fraterna*, and in having the abdominal bristles not so strongly developed. In addition the apical posterodorsal bristle on fore tibia is weakly developed, and the apical mid dorsal and anterodorsal bristles of hind tibiae are nearly on the same transverse level, whereas in *atrata* the apical posterodorsal bristle of fore tibia is well developed, and the apical mid dorsal and anterodorsal bristles of hind tibia are situated on distinctly separated levels. The hypopygium of the male in *geniculata* more closely resembles that of *errans* than of *atrata*.

NEWFOUNDLAND: 1 ♂, St. John's, Aug. 1, 1925, (J. M. Swaine), [C.N.C.].

Stein (45) recorded the species as occurring in North America, but I find that his specimens under *geniculata* at Berlin are *errans* Malloch. These specimens undoubtedly formed the basis for Stein's record, an error repeated by Aldrich (1) in his list of North American diptera, and by Leonard (11) in a list of insects occurring in New York State.

The above specimen from Newfoundland has been compared with European specimens of *geniculata* in the collection of Mr. Ringdahl, and I find no specific differences between the specimens.

12. **Coenosia (Limosia) lata** Walker (Figs. 3, 29, 65)

Coenosia lata Walker, Dipt. Saund., p. 368, 1856. Stein, Zeitschr. f. Hymen. u. Dipt., hft. 4, p. 199, 1901.

Coenosia hypopygialis Stein, Berl. Ent. Zeitschr., (1897), XLII, p. 268, 1898. Smith, Ann. Rept. N. J. State Museum, 1909, p. 793, 1910. Stein, Arch. f. Naturgesch., LXXXIII, (1917), A, hft. 1, p. 160, 1919. Stein, Arch. f. Naturgesch., LXXXIV, (1918), A, hft. 9, pp. 94, 104, 1920. Malloch, Ent. News, XXXII, p. 204, 1921. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 237, 1925. Huckett, Mem. 101 N. Y. (Cornell) Agr. Exp. Station' (1926), p. 835, 1928.

The species is most closely related to *errans* Malloch. In both species the ninth tergum (anal sclerite) of the male is noticeably globular in appearance, and is armed with four or more bristles; in addition, the anal membrane is considerably restricted. In both sexes the apical mid dorsal and anterodorsal bristles of hind tibia are approximated, being situated on nearly the same transverse plane, by which character both species may be distinguished invariably from some of their nearest relatives. There are a few specimens in the series studied in which this character does not hold true for purposes of distinction.

The male of *lata* may be distinguished from that of *errans* in the form of the processes of fifth sternum; in *lata* the processes taper sharply on distal half to angular proportions which have a shining appearance, and have a concave outline along the ventral (inner) margin when viewed in profile, whereas in *errans* the processes are broadly rounded caudad, and have an almost straight profile along ventral (inner) margin. The female of *lata* may be separated from that of *errans* by the shorter and stouter hind tarsus, and by the stouter development of the cephalic pair of ocellar bristles.

CONNECTICUT: 1 ♀, Hartford, Oct. 5, 1896, [Conn. Agr. Exp. Sta.].

FLORIDA: 1 ♀, Dunedin, Apr.

GEORGIA: 1 ♀, Thalman, Apr. 28, 1911. 1 ♀, Billy's Island, Okefenokee Swamp, June 1912, [all C.U.].

ILLINOIS: 1 ♂, Algonquin, (Nason), [Field Museum].

IOWA: 1 ♀, Thompson, Aug. 6, 1928, (G. O. Hendrickson), [H.C.H.].

MANITOBA: 1 ♀, Pierson, July 3, 1927, (H. J. Brodie). 1 ♂, Teulon, July 30, 1924, (A. J. Hunter), [all C.N.C.].

NEW JERSEY: 1 ♀, Brown's Mills, Sept. 3, 1923, (H. C. Hallock), [H.C.H.].

NEW YORK: 1 ♂, 1 ♀, Cold Spring Harbor, Long Island, Sept. 4, 1922. 2 ♂, 6 ♀, Riverhead, Long Island, Aug. 10, 1927; 2 ♂, 1 ♀, Oct. 2, 1927; 1 ♂, 1 ♀, May 22, 1927; 4 ♂, 5 ♀, Sept. 26, 1927; 1 ♂, 1 ♀, Oct. 23, 1927; 1 ♂, 1 ♀, July 23, 1922; 4 ♀, Aug. 20, 1922; 1 ♀, May 20, 1923; 1 ♀, May 27,

1923; 1 ♀, May 2, 1928; 1 ♀, June 27, 1926; 2 ♀, July 28, 1922; 1 ♀, Aug. 6, 1922. 3 ♂, 2 ♀, Mt. Whiteface, 2000–4000 ft. alt., Aug. 22–24, 1916. 2 ♂, 2 ♀, Wilmington, Essex County, Aug. 20–24, 1916, 1000–2000 ft. alt. 1 ♀, Wells, July 26, 1923, (D. B. Young). 1 ♀, Albany, June 20, 1917. 1 ♀, Dryden Lake, Tompkins County, June 16, 1904. 1 ♀, McLean, Tompkins County, July 13, 1920. 1 ♀, Ringwood, Aug. 17, 1928. 2 ♀, Mud Creek, Tompkins County, June 17–20, 1904. 1 ♀, Saranac Lake, Aug. 26, 1916. 1 ♀, Pine Island, June 12, 1917, (S. W. Frost), [H.C.H.].

New Hampshire: 1 ♂, Summit House, Mt. Washington, July 12, 1931, [A.L.M.].

Ontario: 1 ♂, Norway Point, Lake of Bays, July 30, 1919, (J. McDunnough). 1 ♀, Trenton, June 24, 1906. 1 ♂, Conniston, July 1915. 1 ♂, 1 ♀, Waubamick, June 1915, (H. S. Parish), [all C.N.C.].

Quebec: 1 ♂, 1 ♀, Kazubazua, Aug. 16, 1927. 1 ♀, Covey Hill, June 25, 1927. 1 ♀, Knowlton, July 9, 1927, (G. S. Walley). 1 ♀, Hemmingford, July 29, 1923, (C. E. Petch), [all C.N.C.].

Virginia: 1 ♀, Great Falls, Oct. 1922, (R. C. Shannon), [H.C.H.].

There are two female specimens under the name *Coenosia lata* Walker in the Walker collection at the British Museum. Both specimens bear Walker's manuscript label, one named *lata*, the other *intricata*. I feel confident that both specimens are conspecific, and are none other than what has been described by Stein as *Coenosia hypopygialis* at a later date (45). The species *lata* of authors is identical with *Coenosia atrata* Walker, (*canescens* Stein).

Stein (52), (53) considered his *flavipes* as possibly a synonym of *hypopygialis*, but in this he was in error according to Johnson (8) who rightly recognised the synonymy of *flavipes* and *errans*.

13. Coenosia (Limosia) errans Malloch (Figs. 2, 28, 69)

Coenosia flavipes Stein (not Williston), Berl. Ent. Zeitschr., (1897) xlii, pp. 268, 288, 1898. Britton, Bull. 31, Conn. Geol. Nat. Hist. Surv., p. 199, 1920.

Coenosia geniculata Stein (not Fallén), Berl. Ent. Zeitschr., (1897), xlii, p. 267, 1898. Huckett, Mem. 101 N. Y. (Cornell) Agr. Exp. Station, (1926), p. 835, 1928.

Coenosia steini Johnson (not Verrall), Bull. Amer. Mus. Nat. Hist., xxxii, p. 78, 1913.

Coenosia errans Malloch, Trans. Amer. Ent. Soc., xlvi, p. 165, 1920. Malloch, Ent. News, xxxii, p. 204, 1921. Johnson, Occ. Pap. Boston Soc. Nat. Hist., vii, p. 237, 1925. Huckett, Mem. 101 N. Y. (Cornell) Agr. Exp. Station, (1926), p. 835, 1928.

I have already indicated the relationships of this species in the paragraphs devoted to *lata* Walker. There is a considerable

degree of variation in the infuscation of the femora in the specimens before me, some having all femora entirely yellow, others having the fore femora largely infuscated and the mid and hind femora with blackish infuscation on distal third. It seems that specimens of this species having the mid and hind femora infuscated on distal third were named by Stein (45) as *geniculata*, whilst those having the femora entirely yellow were described as *C. flavipes*.

FLORIDA: 1 ♂, Dunedin, March 28, 1918.

GEORGIA: 1 ♂, Tifton, Oct. 1896, 2 ♀, Oct. 17, 1896, [Field Museum]. 1 ♂, 1 ♀, Okefenokee Swamp, June 1912, [C.U.].

NEW HAMPSHIRE: 1 ♂, Alpine Garden, Mt. Washington, July 11, 1931, (A. L. Melander), [A.L.M.].

NEW JERSEY: 1 ♂, Brown's Mills, Sept. 3, 1923. 1 ♂, Westville, May 19, (H. C. Hallock), [H.C.H.].

NEW YORK: 1 ♂, Yaphank, Long Island, June 1, 1929. 1 ♂, Lake Ridge, May 20, 1921. 1 ♂, Montauk, Long Island, Sept. 4, 1927. 1 ♂, Cold Spring Harbor, Long Island, July 14, 1927, (A. L. Melander), [H.C.H.].

14. **Coenosia (Limosia) rufibasis** Stein

Coenosia rufibasis Stein, Arch. f. Naturgesch., LXXXIV, (1918), A, hft. 9, pp. 101, 1920.

Coenosia strigifemur Stein, Arch. f. Naturgesch., LXXXIV, (1918), A, hft. 9, pp. 103, 1920.

The male of this species may be recognised on account of the dense series of fine, long bristles along the processes of fifth sternum. In addition the abdominal sterna each bear a pair of longish bristles. The abdomen has small brownish spots on terga 3 and 4 and occasionally on tergum 5. The abdominal bristles are well developed, including those along the caudal margin of fifth tergum. The mid femur possesses a preapical bristle on anterior surface, the fore tibia a well developed apical posterodorsal bristle. The species has a close resemblance to *C. sexnotata* and *C. johnsoni*, from which it may be distinguished by the characters given in the key. In common with these species the coxae and fore femora apparently vary greatly in the extent of infuscation. I have come to the conclusion that *C. strigifemur* Stein is nothing more than a darkened form of *rufibasis*. In both types the abdominal and hypopygial characters are strikingly similar.

The female of *rufibasis* is similar to the male, there being traces of three brownish vittae on mesonotum, and brownish spots on

abdomen. The fore femur has more or less infuscation along the dorsal surface. From the female of *bonita* the species is difficult to distinguish. In the former species the third antennal segment is reddish at base, whereas in *rufibasis* the third antennal segment is entirely blackish. Sometimes the coxae of females in *rufibasis* may be largely blackish. Such specimens may be distinguished from females of allied species by the strong development of the discal bristles on abdominal terga, the presence of a preapical bristle on anterior surface of mid femur, and by a smallish lower calyptra.

CALIFORNIA: 1 ♀, Mesa Grande, Russian R., Sept. 30, 1908, (J. C. Bradley), [C.U.].

IDAHO: 1 ♀, Worley, June 29, 1919, (A. L. Melander), [A.L.M.].

OREGON: 1 ♂, Hood River, (Childs). 1 ♀, Corvallis, July 17, (A. L. Lovett), [all Ore. Agr. Col.]. 1 ♂, Eagle Creek, Aug. 2, 1921, (A. L. Melander), [A.L.M.].

WASHINGTON: 1 ♀, Pullman, Aug. 16, 1910. 1 ♂, Pluvius, July 16, 1912, 1 ♂, Longmire, Mt. Rainier, July 18, 1922, (A. L. Melander), [all A.L.M.].

15. Coenosia (Limosia) sexnotata Meigen

Coenosia sexnotata Meigen, Syst. Beschr., v, p. 213, 1826. Smith, Ann. Rept. N. J. State Museum, 1909, p. 793, 1910.
Anthomyza sexnotata Zetterstedt, Ins. Lapponica, p. 694, 1840.
Caricea sexnotata Stein, Ent. Nachr., XIV, p. 379, 1888.
Coenosia intermedia Pandellé not Fallén, Rev. ent. France, XVIII, p. 144, 1899.
Coenosia longimaculata Stein, Arch. f. Naturgesch., LXXXIV, (1918) A, hft. 9, p. 97, 98, 1920.

The material before me is undoubtedly similar to that described by Stein (45) as a variety of *Coenosia sexnotata* Meigen. Later Stein (53) redescribed the same species as *Coenosia longimaculata*. North American specimens of *sexnotata* differ most noticeably from European specimens of the same species in having the coxae more grayish infuscated and in lacking a well developed mid anterodorsal bristle on mid tibia of male. For the present I am inclined to believe that neither of these characters can be considered as of specific importance. The case at hand perhaps well exemplifies the difficulty attached to linking up many so-called European forms occurring in North America with those in the Old World, in that these forms, if they do exist in North America, generally exhibit some slight variation in structure, chaetotaxy, or coloration when compared with European specimens that makes it difficult to decide whether the species can

be considered the same or not. It may well be that in such cases, and there are a number of them among the Muscidae, it would cause less confusion if the North American examples were recognised as different from those occurring in Europe, even if only as a variety of the latter. A decision in this matter is beyond the scope of the present paper, entailing as it does a wide knowledge of geographical distribution, phylogeny, and variation.

The species resembles those of *rufibasis* Stein and *johnsoni* Malloch. The males of *sexnotata* and *johnsoni* may be distinguished from those of *rufibasis* in that the bristles on proximal half of processes of fifth sternum of abdomen are much shorter than those situated distad; the mid femur has no preapical bristle on anterior surface; and the abdominal sternum 4 has no long bristles of equal length to those at apex of processes of fifth sternum. The male of *sexnotata* differs from that of *johnsoni* in that the anteroventral bristles of hind femur are uniform in size, not longer basad, and the coxae are more or less suffused with grayish infuscation, not being entirely yellow. The female of *sexnotata* has the fore coxae largely blackish infuscated, whereas in *rufibasis* and *johnsoni* the fore coxae are largely yellow.

BRITISH COLUMBIA: 1 ♀, Nicola, July 25, 1925, (N. Criddle). 1 ♂, Agassiz, July 15, 1926, (H. H. Ross), [all C.N.C.].

16. **Coenosia (Limosia) flavifrons** Stein

Coenosia flavifrons Stein, Berl. Ent. Zeitschr., (1897), XLII, p. 261, 1898. Stein, Arch. f. Naturgesch., LXXXIII, (1917) A, hft. 1, p. 159, 1919. Stein, Arch. f. Naturgesch., LXXXIV, (1918) A, hft. 9, p. 94, 1920. Malloch, Ent. News, XXXII, p. 202, 1921. Huckett, Mem. 101 N. Y. (Cornell) Agr. Exp. Station, (1926), p. 835, 1928.

This is a robust species, and, as indicated by Stein (45), it superficially resembles *Macrorchis ausoba* Walker, owing to the ochreous pollen on mesonotum and abdominal terga, the brassy sheen on frons, the robust tarsal segments, and by the strong bristles on femora. The mesonotum has no vitta, and the abdomen, with the exception of fifth tergum in female, no paired spots. The hind femur possesses straight strong bristles on anteroventral and posteroventral surfaces, which are longer basad. All the coxae are blackish, and the femora and tarsi yellow.

GEORGIA: 1 ♂, Tifton, Aug. 29, 1896; 1 ♀, Oct. 16, 1896, [U.S.N.M.].

17. **Coenosia (Limosia) dorsovittata** Malloch

Coenosia dorsovittata Malloch, Trans. Amer. Ent. Soc., XLVI, p. 167, 1920. Malloch, Ent. News, XXXII, p. 203, 1921.

The species superficially resembles *atrata* Walker, from which it may be readily distinguished by the weaker development of the abdominal bristles and of the apical posterodorsal bristle on fore tibia.

COLORADO: 1 ♂, Grant, July 21, 1916, Geneva Park, 10,000 ft. alt., (E. C. Jackson), [U.S.N.M.].

SASKATCHEWAN: 1 ♀, Radison, July 30, 1907, (J. Fletcher), [C.N.C.].

18. **Coenosia (Limosia) atrata** Walker (Figs. 5, 32, 61)

Coenosia atrata Walker, Insecta Saund., p. 368, 1856. Stein, Zeitschr. f. Hymen. u. Dipt., p. 187, 1901. Stein, Arch. f. Naturgesch., LXXXIII, (1917) A, hft. 1, p. 158, 1919.

Caricea lata Slosson not Walker, Ent. News, VI, p. 6, 1895.

Coenosia canescens Stein, Berl. Ent. Zeitschr., (1897), XLII, p. 265, 1898. Stein, Zeitschr. f. Hymen. u. Dipt., I, 4 p. 187, 1901. Stein, Arch. f. Naturgesch., LXXXIII, (1917), A, hft. 1, p. 159, 1919. Stein, Arch. f. Naturgesch., LXXXIV, (1918), A, hft. 9, p. 95, 103, 1920. Huckett, Mem. 101 N. Y. (Cornell) Agr. Exp. Station, (1926), p. 835, 1928.

Coenosia lata Coquillett (not Walker), Proc. Wash. Acad. Sci., II, p. 445, 1900. Smith, Ann. Rept. N. J. State Museum 1909, p. 793, 1910. Johnson, Bull. Amer. Mus. Nat. Hist., XXXII, p. 78, 1913. Malloch, Trans. Amer. Ent. Soc., XLIV, p. 285, 1918. Stein, Arch. f. Naturgesch., LXXXIII, (1917), A, hft. 1, p. 160, 1919. Britton, Bull. 31 Conn. Geol. Nat. Hist. Surv., p. 199, 1920. Malloch, Ent. News, XXXII, p. 204, 1921. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 237, 1925. Johnson, Insect Fauna, Biol. Surv. Mt. Desert Region, p. 211, 1927. Huckett, Mem. 101 N. Y. (Cornell) Agr. Exp. Station, (1926), p. 835, 1928.

Coquillett (3) in 1900 evidently regarded *C. lata* Walker as identical with *C. canescens* Stein, although Stein himself was not so sure of this when he (46) examined Walker's types.

I have assumed that all references to *lata* previous to Coquillett's time are based on Walker's faunal record, and that those of Slosson, Johnson, and others that follow are based on Coquillett's acceptance of *canescens* as a synonym of *lata*. An examination of Walker's specimens in the British Museum revealed that the two female specimens under *C. lata* are identical with *C. hypopygialis* Stein, and that the female specimen under *C. atrata*, although in poor condition, is undoubtedly recognisable and is in my opinion identical with *C. canescens*.

This is by far the commonest and perhaps most widely distributed coenosian fly on the North American continent.

In structure it resembles the American species *nigrescens* Stein and *impunctata* Malloch, and the European species *pygmaea*. From *nigrescens* the species may be distinguished in that the mid and hind femora are in part yellowish basad, and are not entirely blackened. There is a considerable degree of variation in this respect in *atrata*, especially among the female specimens, but in nearly every case there are at least distinct indications of yellowish coloration basad although the remainder of the mid and hind femora may be largely blackish as in *nigrescens*. From *impunctata* Malloch the species may be readily distinguished by the blackened coloration of fore coxae. I have before me a series of fifteen male specimens collected on Billy's Island, Okefenokee Swamp, Georgia, which resemble *impunctata* in that they lack the abdominal spots and thoracic vittae present on specimens from northern States. In addition, many of the Georgia specimens have the femora and tarsi largely yellowish, but all the coxae are entirely blackish. This testaceous tendency in the coloration of the legs is also apparent in specimens of *errans* from Georgia, northern specimens having the femora and tarsal segments considerably darkened in part. From *pygmaea* the species may be distinguished in the male sex by the shorter, wider processes of fifth abdominal sternum, the stronger development of the abdominal bristles, and by the different arrangement of the apical bristles on hind tibia. In *atrata* the apical mid dorsal and anterodorsal bristles are situated on markedly different transverse planes, whereas in *pygmaea* such bristles are closely approximated, being situated on nearly the same transverse plane.

FLORIDA: 1 ♂, Ft. Myers, Apr. 24, 1930, (A. L. Melander), [A.L.M.].

ILLINOIS: 1 ♂, 1 ♀, Chicago, May 4, 1899, [Field Museum].

IOWA: 1 ♂, Ames, May 2, 1928. 1 ♂, Amana, June 23, 1928. 1 ♂, Ledyard, July 7, 1928, (G. O. Hendrickson), [H.C.H.].

LOUISIANA: 1 ♂, New Orleans, Jan. 1, 1932, (A. L. Melander), [A.L.M.].

MARYLAND: 1 ♂, Seaside, June 23, 1931. 1 ♂, Cabin John, June 20, 1931, (A. L. Melander), [A.L.M.].

MASSACHUSETTS: 1 ♂, Naushon, Aug. 15, 1926, (A. L. Melander), [A.L.M.].

MISSOURI: 1 ♂, Columbia, (C. R. Crosby), [C.U.].

MONTANA: 1 ♂, Bozeman, May 24, 1916, [Mont. Agr. Exp. Sta.].

NEW HAMPSHIRE: 1 ♂, Alpine Gardens, Mt. Washington, July 11, 1931, (A. L. Melander), [A.L.M.].

New York: 1 ♂, Speculator, June 18, 1916, 1 ♀, June 13, 1922, (D. B. Young). 1 ♂, Karner, Oct. 4, 1912, (D. B. Young). 1 ♂, Ithaca, July 16, 1903; 2 ♂, July 26, 1905; 1 ♀, July 9, 1904; 1 ♂, Sept. 13, 1916; 1 ♂, 19; 1 ♀, Aug. 8, 1903; 1 ♀, July 15, 1907; 1 ♂, Sept. 1, 1914; 1 ♂, Aug. 17, 1903; 1 ♂, Aug. 27, 1914; 1 ♀, July 26, 1891; 1 ♀, Sept. 14, 1889. 2 ♀, Ringwood, near Ithaca, Oct. 11, 1920; 1 ♀, June 26, 1920; 1 ♀, July 13, 1920. 1 ♂, Caroline-Harford, June 15, 1904. 1 ♂, Wells, July 19, 1913. 1 ♂, Varna, July 26, 1920. 1 ♂, McLean, May 31, 1913. 2 ♂, 4 ♀, Mud Creek, Tompkins County, June 17–20, 1904. 1 ♂, Rhinebeck, July 27, 1907, (C. R. Crosby). 1 ♂, Chipmunk Swamp, Vandalia, June 8–10, 1915. 1 ♀, Montezuma Marsh, July 1, 1920. 1 ♀, Beebe Lake, Ithaca, June 22, 1920. 2 ♀, Northampton, June 26, 1914, (D. B. Young). 2 ♀, Sport Island, Sacondaga River, (C. P. Alexander). 1 ♀, Danby, May 14, 1916, (E. G. Anderson). 1 ♀, Slaterville, Aug. 15, 1921. 2 ♂, 7 ♀, Riverhead, Long Island, Sept. 26, 1927; 1 ♂, Aug. 20, 1927; 9 ♂, 10 ♀, Oct. 2, 1927; 7 ♂, 19 ♀, Aug. 10, 1927; 4 ♂, Sept. 26, 1927. 1 ♂, Yaphank, Long Island, June 1, 1929. 3 ♂, Montauk Point, Long Island, Sept. 4, 1927. 1 ♂, Cold Spring Harbor, Long Island, July 19, 1927, (A. L. Melander), [H.C.H.].

19. **Coenosia (Limosia) nudiseta** Stein (Figs. 14, 41, 79)

Coenosia nudiseta Stein, Berl. Ent. Zeitschr., (1897), XLII, p. 273, 1898. Smith, Ann. Rept. N. J. State Museum, 1909, p. 793, 1910. Malloch, Ent. News, XXXII, p. 203, 1921. Stein, Arch. f. Naturgesch., LXXXIII, (1917), A, hft. 1, p. 161, 1919. Stein, Arch. f. Naturgesch., LXXXIV, (1918), A, hft. 9, p. 94, 105, 1920. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 238, 1925. Johnson, Insect Fauna, Biol. Surv. Mt. Desert Region, p. 211, 1927. Huckett, Mem. 101 N. Y. (Cornell) Agr. Exp. Station, (1926), p. 835, 1928.

This species may be readily recognised by the characteristic appearance of the head, which in many respects is typical of species belonging to Phyllogaster. The cheeks and parafacials at base of antennae are strikingly broad and prominent, being almost equal in width and height respectively to the distance between oral vibrissae; the antennae are attached to the head at a level with the upper half of the eye; and the arista is minutely pubescent. In addition, the palpi and legs, including coxae and tarsi, are entirely yellowish.

Massachusetts: 1 ♀, Eastham, June 27, 1904. 1 ♀, Chatham, June 30, 1904. 1 ♂, 3 ♀, Provincetown, Aug. 18, 1926, (A. L. Melander), [A.L.M.].

New Jersey: 1 ♂, 1 ♀, Ocean City, June 10. 1 ♀, Seaside Park, Sept. 19, 1926, (A. L. Melander), [A.L.M.].

New York: 4 ♂, 9 ♀, Riverhead, Long Island, Aug. 10, 1927; 4 ♀, Sept. 26, 1927; 1 ♀, Oct. 2, 1927. 1 ♀, Long Beach, Long Island, June 20, 1920. 2 ♂, 3 ♀, Cold Spring Harbor, July 14, 1927, (A. L. Melander), [A.L.M.].

Quebec: 1 ♂, Godbout, July 25, 1918, (E. M. Walker), [C.N.C.].

20. **Coenosia (Limosia) modesta** Loew

Coenosia modesta Loew, Berl. Ent. Zeitschr., XVI, p. 95, 1872. Stein, Arch. f. Naturgesch., LXXXIII, (1917), A, hft. 1, p. 161, 1919. Stein, Arch. f. Naturgesch., LXXXIV, (1918), A, hft. 9, p. 100, 1920. Malloch, Ent. News, XXXII, p. 201, 205, 1921. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 237, 1925. Huckett, Mem. 101 N. Y. (Cornell) Agr. Exp. Station, (1926), p. 835, 1928.

Coenosia pallida Stein, Arch. f. Naturgesch., LXXXIV, (1918), A, hft. p. 9, 94, 100, 1920.

Stein claims that *pallida* is distinct from *modesta* on account of the entirely yellow coloration of occipital region of head and of scutellum, which in *modesta* are said to be entirely or partly grayish. I have seen the types of *pallida* in the Stein collection at the Museum of the University of Berlin, and am of the opinion that the species is identical with *modesta*. In the series of specimens before me I find that the degree of infuscation on the occipital region of head, and the extent to which the brownish spots at basal angles of scutellum and on tergal sclerites of abdomen may be recognised, is uncertain.

As indicated in the key, the species may be readily distinguished from its nearest relatives on account of the largely yellow coloration of the head, thorax, and their appendages, and by the peculiar broad black thoracic stripe when present.

ILLINOIS: 3 ♀, Savanna, June 14, 1917. 1 ♀, Homer, June 17, 1917, [Ill. N.H.S.].

MANITOBA: 1 ♀, Teulon, June 12, 1923, (A. J. Hunter), [C.N.C.].

MINNESOTA: 1 ♂, Olmsted County, (C. N. Ainslie).

NEBRASKA: 1 ♀, Fremont, July 17, 1900, (O. A. Johannsen), [C.U.].

NEW YORK: 1 ♀, Ithaca, Aug. 28, 1894. 2 ♀, Sport Island, Sacondaga River, (Alexander), [H.C.H.].

ONTARIO: 1 ♀, Pt. Pelee, June 23, 1927, (F. P. Ide); 1 ♀, May 28, 1925, (G. S. Walley), [all C.N.C.].

QUEBEC: 1 ♀, Kazubazua, Aug. 17, 1927, (G. S. Walley), [C.N.C.]. 1 ♀ St. Ann-Parade, Aug. 16, 1930. 1 ♀, Montreal, Aug. 8, 1930, (A. L. Melander), [A.L.M.].

21. **Coenosia (Limosia) argentata** Coquillett

Coenosia argentata Coquillett, Dipt. Invert. Pacif., I, p. 33, 1904. Malloch, Trans. Amer. Ent. Soc., XLIV, p. 285, 1918. Stein, Arch. f. Naturgesch., LXXXIII, (1917), (A), hft. 1, p. 158, 1919. Malloch, Ent. News, XXXII, pp. 203, 205, 1921.

Coenosia argenticolor Stein, Arch. f. Naturgesch., LXXXIV (1918), (A), hft. 9, p. 96, 97, 1920.

This species belongs to the *fuscifrons* group, and may be readily distinguished from any in the group by the entirely silvery frons in the male, and by the dense whitish or brownish pruinescence of the entire frontal vitta in the female.

CALIFORNIA: 1 ♀, Palo Alto, Oct. 26, 1894, (R. W. Doane).
WASHINGTON: 1 ♂, South Bend, May 23, 1917, (A. L. Melander), [A.L.M.]. 1 ♀, Ilwaco, May 18, 1918, (A. Spuler), [Wash. State Col.].

22. **Coenosia (Limosia) fuscifrons** Malloch (Figs. 20, 46, 54)

Coenosia fuscifrons Malloch, Canad. Ent., LI, p. 96, 1919. Malloch, Ent. News, XXXII, pp. 203, 205, 1921. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 237, 1925. Johnson, Insect Fauna, Biol. Surv. Mt. Desert Region, p. 211, 1927. Huckett, Mem. 101 N. Y. (Cornell) Agr. Exp. Station, (1926), p. 835, 1928.

This is the species discussed by Stein (53) in his remarks following his description of *C. argenticolor*.

The species is typical of a group of seven or eight species in which the sexes are considerably unlike in appearance, and in the chaetotaxy of the legs. Hence it is not always with certainty that the sexes may be linked together. Such a group includes *fuscifrons* Malloch, *argentata* Coquillett, *anthracina* Malloch, *oregonensis* Malloch, *argenticeps* Malloch, *setigera* Malloch, and *pilosissima* Stein.

In the male the species are very small, being much smaller than the female, rarely attaining a length greater than 3 mm.; the legs are long and slender with fine slender bristles; the abdomen is small with fine short bristles, and the hypopygium is inconspicuous; the abdominal spots, when present, are invariably sooty black in shade (exception *pilosissima*); in most species the setulae on humeral callosities are stiff and spinulose; and the wings are long and slender. In the female, the group may be recognised by the presence of stiff, spinulose setulae on humeral callosities, and by a similar development of the presutural pair of dorsocentral setulae; by the dense blackish or brownish black spots on abdomen; and by the weak bristling of abdomen.

The male of *fuscifrons* most closely resembles those of *anthracina* and *argentata* in that all the femora and tibiae are more or less suffused throughout the distal half with brownish infuscation, whereas in the remaining species the femora and tibiae are entirely yellow, or, if the femora are more or less infuscated, the tibiae are entirely yellow. From *argentata*, *fuscifrons* may be

distinguished by having the frontal vitta blackish, eyes not so widely separated, and the parafrontals with two pairs of bristles, whereas in *argentata* the frons is silvery pruinescent, the eyes are separated by a distance greater than maximum breadth of eye when viewed from in front, and the parafrontals have only one pair of bristles. From *anthracina*, *fuscifrons* may be distinguished by the densely pearlasceous pruinescence of the abdomen, whereas in *anthracina* the abdomen is grayish drab with trace of pruinescence. The females are not so readily distinguished as the males in the case of most of the species. The female of *fuscifrons* may be distinguished from that of *anthracina* in that the femora are not entirely black as in *anthracina;* from *argentata*, in that the frontal vitta and frontal triangle, when viewed from above, are not uniformly pruinescent and hence indistinguishable, the frontal vitta being blackish and the frontal triangle brownish pruinescent, when viewed from above, in *fuscifrons*. From other allied species the female of *fuscifrons* may be distinguished by the fuscation on mid and hind tibiae, which are darker in color than the yellowish area of femora, and by the fact that the frontal vitta, when viewed from in front, is opaque black, whereas in allied forms the mid and hind tibiae are yellow, being concolorous with yellowish portion of femur, and the frontal vitta, when viewed from in front, is grayish or brownish pruinescent.

MICHIGAN: 1 ♀, Alpena, Sept. 24, 1908, (Nason), [Ill. N.H.S.].

MINNESOTA: 1 ♂, 1 ♀, Duluth, St. Louis County, Aug. 6–8, 1912, (Witmer Stone), [A.N.S.P.].

NEWFOUNDLAND: 1 ♀, Carbonier, Aug. 2, 1925, (J. M. Swaine), [C.N.C.].

NEW HAMPSHIRE: 2 ♀, Mt. Monadnock, June 12, 1920.

NEW YORK: 3 ♂, Sport Island, Sacondaga River, (C. P. Alexander). 1 ♂, Top of Mt. Marcy, Aug. 28, (Shannon & Sibley). 1 ♀, Mt. Whiteface, alt. 2000–4000 ft., Aug. 22–24, 1916, [H.C.H.].

NOVA SCOTIA: 1 ♀, Truro, Sept. 15, 1913, (R. Matheson), [C.U.].

ONTARIO: 1 ♂, Orillia, June 7, 1925, (C. H. Curran). 1 ♂, Kearney, July 8, 1926, (F. P. Ide). 1 ♀, Ottawa, Aug. 1, 1924. 1 ♂, 1 ♀, Waubamick, July 1915. 1 ♂, Conniston, June 1915, (H. S. Parish), [all C.N.C.].

QUEBEC: 1 ♀, Aylmer, Aug. 10, 1924, (C. H. Curran). 1 ♀, Meach Lake, June 21, 1916. 1 ♀, Hemmingford, Aug. 29, 1916, (J. I. Beaulne), [all C.N.C.].

WASHINGTON: 1 ♂, Lake Paha, May 20, 1920. 1 ♂, Coulee City, Sept. 3, 1920, (R. C. Shannon). 1 ♂, Okanogan, May 20, 1924. 1 ♂, Peterboro, Aug. 3, 1919. 1 ♂, Yakima, July 18, 1920. 1 ♂, Ilwaco, June 8, 1925, (A. L. Melander), [all A.L.M.].

Wisconsin: 1 ♀, Brule River, Douglas County, Aug. 23, 1912, (Wetmore Stone), [A.N.S.P.].

23. **Coenosia (Limosia) anthracina** Malloch (Figs. 26, 52, 60)

Coenosia anthracina Malloch, Ent. News, xxxii, pp. 134, 205, 1921. Frison, Bull. Ill. Nat. Hist. Surv., xvi, p. 197, 1927.

The species was described by Malloch (21) from the female sex only, in which he likens the species to *fraterna*. I have been able to recognise the male sex, which structurally and in coloration of the legs closely resembles *fuscifrons*, and from which it may be separated on account of its drab color and subshining appearance. In common with *fuscifrons* the male has the frons velvety black and the abdominal bristles weakly developed. The female may be readily distinguished from others of the *fuscifrons* group by the entire infuscation of all femora, as in *nigrescens* and *fraterna*, but from the females of these two species that of *anthracina* differs in that the apical posterodorsal bristle of fore tibia is much weaker developed than the apical mid dorsal bristle, and the humeral setulae and presutural pair of dorsocentral setulae are spinulose in character.

Male, grayish drab; frons as in female, velvety black, the parafacials seal brown infuscated; parafacials, cheeks, and face whitish pruinescent; antennae and palpi entirely blackish. Thorax and abdomen uniform in coloration, with slight brownish pruinescence; mesonotum with trace of brownish vittae, when viewed from in front; humeral callosities pale grayish, as pleura. Abdominal terga unmarked; hypopygium and fifth sternum concolorous with terga. Legs as in *fuscifrons;* fore coxae largely yellowish; mid and hind coxae largely grayish; fore femur largely infuscated or similar to mid and hind femora; mid and hind femora broadly infuscated on distal half, the proximal area yellowish. All tibiae densely infuscated, brownish; tarsi blackish; pulvilli white. Wings brownish tinged, veins brownish black; calyptrae white; halteres yellow.

Eyes separated by about one-third maximum breadth of head, when viewed from above; cephalic pair of ocellar bristles well developed; parafrontals with three pairs of bristles, of which the middle pair are short; third antennal segment scarcely twice as long as second segment; cheeks about as high as breadth of third antennal segment, ventral margin of eye reaching a level with oral vibrissae; marginal bristles of cheeks well developed. Humeral callosities armed with stiff short spinules; presutural pair of dorsocentral setulae stout and spinulose. Abdomen short,

and broadly conical, when viewed from above; with weak bristles: hypopygium large; fifth sternum sparsely clothed with fine setulae and bristles.

Legs slender, chaetotaxy as in *fuscifrons;* fore tibia with a mid posterior bristle, apical posteroventral bristle setulose. Mid femur with a longish bristle on proximal half of anteroventral and posteroventral surfaces, situated at about the same distance from base of femur; mid tibia with a mid anterior and posterior bristle, the former longer than the latter, apical posteroventral bristle minute; hind femur with fine longish bristles on anterodorsal and anteroventral surfaces, posteroventral surface with a longish bristle at middle; hind tibia with a fine longish mid anterodorsal and apical dorsal bristle, with a mid anteroventral bristle, apical anterodorsal bristle setulose. Tarsi slender, pulvilli and claws small.

Length, 2.75 mm.

ALBERTA: 1 ♀, Banff, July 23, 1922, (C. B. D. Garrett). 1 ♀, Waterton, July 10, 1923, (H. L. Seamans), [all C.N.C.].

BRITISH COLUMBIA: 1 ♂, Carbonate Columbia River, July 7–12, 1908, 2600 ft. alt., [C.U.]. 1 ♀, Fairmont, July 28, 1926, (A. A. Dennys). 1 ♀, Rolla, July 14, 1927, (P. N. Vroom), [all C.N.C.].

MONTANA: 1 ♂, 1 ♀, Gallatin County, July 15, 1913, alt. 6500 ft. 1 ♂, Bridger Mts., Aug. 10, 1915, alt. 5500 ft., [Mont. Agr. Exp. Sta.]. 1 ♂, Gardiner, Aug. 17, 1918.

WYOMING: 1 ♂, Lake, Yellowstone Park, July 18, 1923. 1 ♂, Clematis Creek, Yellowstone Park, July 9, 1923. 1 ♂, Riverside, Yellowstone Park, Aug. 4, 1918. 1 ♂, 1 ♀, Apollinaris, Yellowstone Park, July 8, 1923. 1 ♀, W. Craig's Pass, Yellowstone Park, 7900 ft., Aug. 8, 1918. 1 ♂, Canyon Camp, Yellowstone Park, Aug. 12, 1918. 1 ♂, Gallatin Canyon, July 28, 1923, (A. L. Melander), [all A.L.M.]. 1 ♀, Canyon Camp, Yellowstone Park, Aug. 27, 1915, 7700 ft.

24. **Coenosia (Limosia) argenticeps** Malloch (Figs. 23, 49, 57)

Coenosia argenticeps Malloch, Trans. Amer. Ent. Soc., XLVI, p. 166, 1920. Malloch, Ent. News, XXXII, pp. 202, 205, 1921.

The males of the species *argenticeps, setigera, oregonensis,* and *pilosissima* differ essentially from those of other species in the *fuscifrons* group in that all the femora and tibiae are invariably yellowish, the tibiae possessing no trace of fuscous coloration. The males of *argenticeps* and *setigera* possess abnormally long slender bristles on anteroventral, anterodorsal, and posteroventral surfaces of hind femur; that of *argenticeps* has the third antennal segment and palpi entirely yellow, whereas the male of *setigera* has the third antennal segment and palpi largely fuscous, black-

ish. The female of *argenticeps* closely resembles that of *oregonensis* and *pilosissima*, differing essentially as indicated in the key (p. 147), in the extent of infuscation present on the fore, mid, and hind femora.

This is the species discussed by Stein (53) in his remarks following the description of *pilosissima*.

CALIFORNIA: 1 ♂, Three-Rivers, Giant Forest, Tulare County, alt. 800–6500 ft., July 16, 1907. 1 ♂, Alta Meadows, Sequoia National Park, alt. 9000 ft., July 19, 1907, (J. C. Bradley), [all C.U.].

MONTANA: 1 ♂, Bozeman, June 12, 1916, [Mont. Agr. Exp. Sta.]. 1 ♂, Gardiner Vall., Aug. 20, 1918, (A. L. Melander) [A.L.M.].

WYOMING: 1 ♂, Lewis Lake, Yellowstone Pass, July 17, 1923, [A.L.M.].

OREGON: 1 ♂, Hood River, (Childs). 1 ♂, Corvallis, April 28, 1903. 1 ♀, Hood River, Sept. 4, 1917, [all Ore. Agr. Col.].

WASHINGTON: 1 ♂, Friday Harbor, July 9, 1924. 1 ♂, Seattle, May 25, 1919, (J. S. Hine), [H.C.H.]. 1 ♂, Mt. Vernon, July 2, 1924. 1 ♂, Everett, Lake Stephens, Aug. 3, 1917. 1 ♂, Sultan, Aug. 1, 1917, (A. L. Melander), [all A.L.M.].

25. **Coenosia** (**Limosia**) **setigera** Malloch (Figs. 24, 50, 58)

Coenosia setigera Malloch, Trans. Amer. Ent. Soc., XLIV, p. 284, 1918. Malloch, Ent. News, XXXII, p. 202, 1921.

The male of *setigera* has the frontal vitta deep black as in *fuscifrons* and *anthracina*, but differs from these species in that the femora and tibiae are largely or entirely yellow; it resembles *argenticeps* in that the bristles on the hind femur are proportionately long, but the male of that species has the palpi and third antennal segment entirely yellow, whereas in *setigera* these appendages are largely blackish. I have not been able to recognise the female of this species.

NEW MEXICO: 1 ♂, Beulah, June 28, 1902, (Top of range), [A.N.S.P.].

26. **Coenosia** (**Limosia**) **nudipes** Stein

Coenosia nudipes Stein, Arch. f. Naturgesch., LXXXIV, (1918), (A), hft. 9, p. 99, May, 1920.

The species is related to *C. albibasis* Stein, and in the male sex may be distinguished from this species by the lack of bristles at middle of all tibiae.

WASHINGTON: 1 ♂, Friday Harbor, July 19, 1905. 1 ♂, Guemes Island, July 13, 1905, (Zool. Mus. Univ. Berl.), [Z.M.U.B.].

27. **Coenosia (Limosia) nivea** Loew

Coenosia nivea Loew, Berl. Ent. Zeitschr., XVI, pp. 70, 94, 1872. Smith, Ann. Rept. N. J. State Museum, 1909, p. 793, 1910. Johnson, Bull. Amer. Mus. Nat. Hist., XXXII, p. 78, 1913. Stein, Arch. f. Naturgesch., LXXXIII, (1917), (A), hft. 1, p. 161, 1919. Stein, Arch. f. Naturgesch., LXXXIV, (1918), (A), hft. 9, pp. 95, 104, 1920. Britton, Bull. 31 Conn. Geol. Nat. Hist. Surv., p. 199, 1920. Malloch, Ent. News, XXXII, pp. 201, 205, 1921. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 238, 1925. Huckett, Mem. 101 N. Y. (Cornell) Agr. Exp. Station, (1926), p. 835, 1928.

Caricea nivea Slosson, Ent. News, VI, p. 6, 1895.

The males of *nivea* and *albibasis* may be readily recognised on account of the peculiar whitish translucent appearance of the basal abdominal segments. In common with *fuscifrons* the males have the abdomen densely pearlasceous pruinescent, but in *fuscifrons* the abdomen is opaque blackish at base. The male of *nivea* may be distinguished from that of *albibasis* in that the frons and thorax are both densely whitish pruinescent and the cephalic pair of ocellar bristles is finely developed, whereas in *albibasis* the mesonotum and frontal vitta are blackish and the cephalic pair of ocellar bristles is well developed.

ILLINOIS: 1 ♂, Savanna, June 14, 1917, [Ill. N.H.S.].

NEW YORK: 1 ♂, Malloryville, Tompkins County, June 18–20, 1904, [H.C.H.].

28. **Coenosia (Limosia) albibasis** Stein (Figs. 25, 51, 59)

Coenosia albibasis Stein, Arch. f. Naturgesch., LXXXIV, (1918), (A), hft. 9, p. 95, 1920.

I have already pointed out the relationships of this species to closely allied forms in the discussion of *nivea*, as indicated by the male sex. The female differs widely from the male in coloration and pruinescence of body, being grayish black with more or less trace of yellowish testaceous at base of or on ventral aspect of abdomen. In this respect the species resembles the female of *frisoni*, from which it may be distinguished by having the tarsi blackish and not yellowish, the abdominal bristles weakly developed, and the cephalic pair of ocellar bristles well developed, whereas in *frisoni* the abdominal bristles are strongly developed and the cephalic pair of ocellar bristles are finely developed.

BRITISH COLUMBIA: 1 ♂, 1 ♀, Saanich, June 22, 1918, (W. Downes). 1 ♀, Royal Oak, July 24, 1917, (W. Downes), [all C.N.C.]. 1 ♂, Cowichan Bay, Vancouver Island, July 12, 1924. 1 ♀, Gold Stream, Vancouver Island, July 12, 1924. 1 ♂, Butthart, Vancouver Island, July 11, 1924, (A. L. Melander), [all A.L.M.].

WASHINGTON: 1 ♂, 1 ♀, Takoma Park, Mt. Rainier, July 25, 1922. 1 ♀, Longmire, Mt. Rainier, July 30, 1922. 1 ♂, Hanson Camp, Mt. Rainier, July 31, 1922. 1 ♂, Summerland Trail, Mt. Rainier, July 24, 1924. 1 ♂, Mt Crescent, Piedmont, July 26, 1917. 1 ♂, Ilwaco, July 12, 1922. 1 ♂, Pluvius, July 16, 1922. 1 ♂, 1 ♀, Quilcene, July 24, 1917, (A. L. Melander), [all A.L.M.].

29. **Coenosia (Limosia) frisoni** Malloch (Figs. 17, 44, 73)

Coenosia frisoni Malloch, Trans. Amer. Ent. Soc., XLVI, p. 165, 1920. Malloch, Ent. News, XXXII, p. 202, 1921. Frison, Bull. Ill. Nat. Hist. Surv., XVI, p. 198, 1927.

The male of *frisoni* together with those of the four following species have the abdomen more or less yellowish translucent at base, and blackish caudad with brownish spots on terga. All of the species may be distinguished in the male sex from others having the abdomen conspicuously yellowish on basal half in that the apical posteroventral bristle of mid tibia is short, not longer than diameter of tibia where situated, whereas in *compressa* and other such species the apical posteroventral bristle on mid tibia of male is longer than diameter of mid tibia where situated.

The male of *frisoni* may be readily distinguished from those of the four following species in that the apical dorsal and anterodorsal bristles of hind tibia are approximated, being situated on the same transverse plane, and the distal half of posteroventral surface of hind femur has a series of short but well developed bristles, whereas in the four following species the apical mid dorsal bristle of hind tibia is situated on a plane distinctly basad of the apical anterodorsal bristle, and the hind femur has no series of bristles on distal half of posteroventral surface.

BRITISH COLUMBIA: 1 ♂, Carbonate Columbia River, alt. 2600 ft., July 7–12, 1908, (J. C. Bradley), [C.U.].

30. **Coenosia (Limosia) nivea** var. **brunnescens** Malloch

Coenosia nivea var. *brunnescens* Malloch, Trans. Amer. Ent. Soc., XLVI, p. 165, 1920.

I have seen no specimens of this variety other than the type in the collection of the American Entomological Society at Philadelphia. This specimen was taken at Swarthmore, Pennsylvania. Malloch in his description gives the chief characters whereby the species may be recognised. From the males of the three following species the male of *brunnescens* may be distin-

guished by having the third antennal segment largely brownish fuscous and not entirely yellowish, the mesonotum with three vittae and not with two or none at all.

31. **Coenosia (Limosia) perspicua** new species (Figs. 19, 43, 74)

Stein (53) recorded this species as *Coenosia antennalis*, his specimens coming from Oxford, Idaho. The male of this species structurally resembles that of *oregonensis*. It differs from that species in the appearance of the male copulatory appendages and in having the abdomen yellowish basad. By some it might be considered a variant of *oregonensis* or even a teneral condition of that species. Superficially the species resembles *antennalis* and *furtiva* (p. 177), from which it may be separated in the male by the character of the processes of fifth abdominal sternum, which in *perspicua* are clothed from base to apex with fine bristles and setulae, whereas in *antennalis* and *furtiva* the processes are bare on distal third. In *perspicua* the males have two well marked vittae on mesonotum, which are lacking in *antennalis* and *furtiva*.

Male, head with occipital region grayish black, frontal vitta blackish caudad, reddish cephalad; frontal triangle cinereous pollinose; parafrontals whitish pruinescent; parafacials and cheeks densely whitish pruinescent, with traces of yellowish testaceous; face whitish; third antennal segment entirely lemon yellow; first and second antennal segments and arista yellowish brown; palpi pale yellow; proboscis brownish, polished. Thorax largely grayish black, with two brownish vittae along the planes of dorsocentral bristles; propleura and prosternum yellowish. Abdomen yellowish to reddish yellow basad, grayish black caudad, with well marked brownish black spots on terga that are blackish, such marks becoming inconspicuous on terga that are yellowish. Ninth abdominal tergum (anal sclerite), copulatory appendages, and processes of fifth sternum yellowish, basal segment of hypopygium grayish black. Legs entirely yellowish, including all tarsal segments. Veins of wings yellowish brown, paler basad, membrane slightly tinged.

Head in profile oblong in outline, the vertex flattened; parafacials inconspicuous, narrowed ventrad to lineal proportions; cheeks proportionately broad, higher than breadth of third antennal segment; apex of third antennal segment reaching to a level equal to two-thirds length of face, scarcely reaching to a level with ventral margin of eye; cephalic pair of ocellar bristles short, slightly longer than caudal pair; arista minutely pubescent.

Thorax with humeral setulae and presutural pair of dorsocentral setulae spinulose; basal pair of scutellar bristles much shorter than apical pair, slightly longer than half length of apical bristles.

Abdominal bristles weakly developed; abdominal sterna 2 and 3 with but 1 or 2 bristles at most; processes of fifth sternum sparsely clothed with fine bristles and setulae.

Legs slender; bristles on femora, fore, and mid tibiae finely developed; fore tibia with a fine posterior bristle at middle, apical posteroventral bristle setulose; mid femur with 2 or more bristles on proximal half of anteroventral and posteroventral surfaces; mid tibia with a setulose bristle at middle of anterodorsal surface, and a slightly stronger bristle at middle of posterior surface, apical posteroventral bristle short, not longer than diameter of tibia; hind femur with 2 weak bristles on proximal third of anteroventral surface and with 2 stronger bristles on distal third of anteroventral surface, the posteroventral surface with 2 or 3 bristles on proximal half, distad of which there are no bristles; hind tibia with an anteroventral and anterodorsal bristle at middle, apical mid dorsal bristle situated on a plane distinctly basad of apical anterodorsal bristle, the former bristle as robust and about as long as mid anterodorsal bristle. Wings slender; distal section of M_{1+2} equal to 2.5 times length of penultimate section. Calyptrae distinctly unequal in development.

Length, 3 mm.

Type.—♂; Kern Lake to Rock Creek, Tulare County, California, July 27–Aug. 1, 1915, alt. 6250–7000 ft., [U.S.N.M.].

Paratypes.—1♂. Monida, June 27, 1913, Montana. 1♂, Bozeman, July 8, 1916, Montana, [Mont. Agr. Exp. Sta.].

32. **Coenosia (Limosia) antennalis** Stein (Fig. 53)

Coenosia antennalis Stein, Berl. Ent. Zeitschr., (1897), XLII, p. 272, 1898. Smith, Ann. Rept. N. J. State Museum, 1909, p. 793, 1910. Johnson, Bull. Amer. Mus. Nat. Hist., XXXII, p. 78, 1913. Stein, Arch. f. Naturgesch., LXXXIII, (1917), (A), hft. 1, p. 158, 1919. Malloch, Ent. News, XXXII, p. 201, 1921. Huckett, Mem. 101 N. Y. (Cornell) Agr. Exp. Station, (1926), p. 835, 1928.

I have before me a male and female specimen of *antennalis* belonging to the collection of the United States National Museum. Both specimens were undoubtedly taken at Tifton, Georgia, with the type, the existence of which is unknown to me. I am in doubt regarding the true identity of the female, although the specimen may well prove to be conspecific with the male on examination of additional material. The male of *antennalis* may

be readily distinguished from its nearest relatives by the dense series of setulae along the inner margin of processes of fifth sternum, which extends from base to apex, and by the polished, bare appearance of the processes. The male specimen before me has the apical bristles on fore tibia and the apical posteroventral bristle on mid tibia well developed, the latter bristle being fully as long as diameter of tibia where situated.

33. **Coenosia (Limosia) furtiva** new species (Figs. 16, 42, 76)

The species is allied to *antennalis*, and in the male sex it may be distinguished by the lack of a series of setulae along the inner margin of processes of fifth sternum, the presence of which is so conspicuous in *antennalis*.

Male very similar in appearance to *perspicua;* differs essentially as follows:—head with cephalic pair of ocellar bristles well developed; arista densely pubescent to tip, longest hairs fully as long as basal diameter of arista. Thoracic vittae and abdominal spots not so conspicuously marked. Thorax with humeral setulae and presutural pair of dorsocentral setulae not spinulose. Fore tibia with apical posteroventral bristle well developed; mid tibia with no bristle at middle of anterodorsal surface. Wings with distal section of vein M_{1+2} less than twice as long as penultimate section. Processes of fifth abdominal sternum bare on distal half, as in *antennalis*, but with no dense series of setulae on inner margin as in that species.

Female with head grayish black on occipital region; parafrontals and frontal triangle grayish black with whitish pruinescence; frontal vitta blackish caudad, reddish cephalad; parafacials and cheeks reddish testaceous with whitish pruinescence; face opaque, whitish. Third antennal segment entirely yellowish; first and second segments and arista brownish; palpi yellowish; proboscis brownish, polished. Thorax grayish black, with three faint vittae. Abdomen reddish yellow basad, grayish black caudad, with brownish spots on terga 3 and 4, the macrochaetae set in brownish spots. Legs entirely yellow, tarsi yellowish to brownish. Wings with veins yellowish brown, membrane tinged.

Head with parafrontal, ocellar, and vertical bristles, and oral vibrissae well developed; cheeks about as high as width of third antennal segment, and about equal to half distance between oral vibrissae.

Thorax with humeral and presutural pair of dorsocentral setulae not spinulose in appearance; basal pair of scutellar bristles well developed.

Legs with robust bristles; fore tibia with posterior bristle at middle, and with well developed apical bristles; mid tibia with

strong anterior and posterior bristles at middle, the former situated distad of the latter, apical posterodorsal bristle longish; hind tibia with normal bristling.

Length, 4–4.5 mm.

Type.—♂; Weymouth, New Jersey, Aug. 22, 1926, [H.C.H.].

Allotype.—♀; Medford, New Jersey, Aug. 12.

Additional material from:

Illinois: 1 ♀, Havana, Devil's Hole, June 23, 1926, (Frison and Hayes), [Ill. N.H.S.].

New Jersey: 2 ♀, Medford, Aug. 12. 1 ♂, Weymouth, Aug. 22, 1926, [H.C.H.].

New York: 1 ♀, Pennyquid Barrens, Coram, Long Island, July 8, 1920, (taken at light), [H.C.H.].

34. **Coenosia** (**Limosia**) **bonita** new species (Figs. 4, 30, 71)

The species does not readily lend itself to comparison with others. The male may be recognised by the stout development of the abdomen, prominence of hypopygium, and by the well developed bristles of the legs, in these respects resembling *errans* and *flavifrons;* but the male of *bonita* has the third antennal segment entirely yellow, and not entirely blackish. The female possesses the peculiar character for this subgenus of having a well defined dorsocentral marking on abdomen. In addition the male and female have a preapical bristle on anterior surface of mid femur.

In certain specimens of the male sex the ninth tergum (anal sclerite) is reddish testaceous, in others blackish, but the form and vestiture of this segment is so specific that this color variation should not cause much difficulty in recognising the species.

Male grayish black; head with frontal vitta blackish, densely covered with cinereous pruinescence; frontal triangle more densely pollinose; parafacials, face, and cheeks whitish pruinescent; first and second antennal segments brownish, the latter yellowish apicad and polished on inner surface; third antennal segment entirely yellowish; arista blackish at base, brownish fuscous distad; palpi yellowish to brownish, paler apicad. Thorax grayish black with whitish pollen, with faint traces of three brownish vittae. Abdomen concolorous with thorax, with three pairs of prominent seal brown spots on terga 3, 4, and 5 respectively; terga 1 + 2 with trace of such markings; ninth tergum (anal sclerite) polished along the ventral border, grayish pollinose dorsad. Fore coxae, all femora and tibiae yellow entirely; mid

and hind coxae tinged with grayish infuscation basad; all tarsi brownish yellow. Wings with veins yellowish brown, membrane tinged.

Head, viewed from in front, much broader than high, eyes separated by a distance slightly greater than length of third antennal segment; frontal triangle slender, extending to base of antennae; parafacials at base of antennae scarcely as wide as, and cheeks scarcely as high as breadth of third antennal segment. Antennae proportionately short, third segment not more than twice as long as length of second segment; arista minutely pubescent.

Abdomen cylindrical, stout, not twice as long as wide; ninth tergum (anal sclerite) globose, sparsely setulose, with a pair of weak bristles dorsad, anal membrane not proportionately restricted as in *errans;* fifth sternum deeply incised, sparsely setulose, pendant; processes broad and truncate, the outer border grayish pollinose, the inner margin and across the apical border shining, with a few longish bristles apicad; at apex of inner margin of processes the integument is thickened, and bears a few fine setulae.

Legs with robust bristles; fore tibia with a posterior bristle at middle, and with a well developed apical posteroventral bristle and with weak setulose apical posterodorsal bristle; mid femur with a preapical bristle on anterior surface; mid tibia with an anterior and posterior bristle at middle; hind femur with a series of 4 or 5 strong anteroventral bristles, which increase in length basad, posteroventral surface with 2 longish and a few shorter bristles, all much finer developed than those on anteroventral surface; hind tibia with the normal anterodorsal and anteroventral bristle at middle. Fore and hind basitarsi short, about the same length, scarcely longer than length of apical dorsal bristle of hind tibia.

Female similar to male; third antennal segment largely fuscous, yellowish basad; palpi fuscous. Thoracic vittae more distinct than in male, concolorous with abdominal spots. Abdomen, in addition to paired spots on terga 3 and 4, with brownish dorsocentral vitta on terga 3, 4, and 5; fifth abdominal tergum with no paired spots as on the preceding terga; macrochaetae of abdomen set in brownish spots at base. Fore femur with trace of dorsal infuscation, otherwise the color and bristling of the legs as in male.

Length, 5 mm.

Type.—♂; Cuyamaca Mountains, San Diego County, California, August 16, 1914, (S. C. Bradley), [C.U.].

Allotype.—♀; with same data.

Additional material from:

California: 9 ♂, 1 ♀, same locality and date as type. 1 ♂, 1 ♀, Sugar Pine, Madera County, 4300–5000 ft. alt., Aug. 21–31, 1914. 1 ♂, Three-Rivers, Giant Forest, Tulare County, 800–6500 ft. alt., July 16, 1907, (J. C. Bradley), [all C.U.].

Idaho: 1 ♀, Lookout Mt., Priest Lake, Aug. 20, 1919, (A. L. Melander), A.L.M.].

Washington: 1 ♂, 1 ♀, Longmire, Mt. Rainier, July 18, 1922. 1 ♂, 1 ♀, Takoma Park, Mt. Rainier, July 25, 1922. 1 ♀, Summerland Trail, Mt. Rainier, July 24, 1924. 1 ♂, above Mt. lake, Orcas Island, Aug. 18, 1925. 1 ♂, Klickitat River, Glenwood Road, July 23, 1921. 1 ♀, Lake Chelan, Lucerne, July 29, 1919. 1 ♀, Blynn, Aug. 10, 1921, (A. L. Melander), [all A.L.M.].

35. **Coenosia (Limosia) oregonensis** Malloch (Figs. 22, 48, 56)

Coenosia oregonensis Malloch, Proc. Cal. Acad. Sci., (ser. 4), IX, p. 254, 1919. Malloch, Ent. News, XXXII, p. 202, 1921. Cole and Lovett, Proc. Cal. Acad. Sci., XI, p. 314, 1921.

The male of *oregonensis* most closely resembles that of *argenticeps*, from which it differs essentially in having the bristles of the hind legs shorter. In *oregonensis* the longest bristles on hind femur are shorter than hind basitarsus, whereas in *argenticeps* the longest hind femoral bristles are slightly longer than length of hind basitarsus. In the female the two species are very much alike, differing from the males, as in the cases of *argentata* and *pilosissima*, in that the palpi and third antennal segment are largely, if not entirely, brownish or blackish, whereas in the male the palpi and third antennal segment are entirely yellow.

The female of *oregonensis* may be distinguished from that of *argenticeps* in that the mid and hind femora are broadly infuscated on distal half, and the fore femur is narrowly yellowish on apical and basal thirds, whereas in *argenticeps* the mid and hind femora are largely yellow on distal half, and the fore femur is broadly yellowish on apical and basal thirds.

British Columbia: 1 ♂, Salmon Arm, Aug. 4, 1925. 1 ♀, Nelson, May 31, 1927, (A. A. Dennys); 1 ♀, Agassiz, Aug. 31, 1926, (H. H. Ross), [C.N.C.]. 1 ♂, Langley, Aug. 9, 1917, (A. L. Melander), [A.L.M.].

Montana: 1 ♀, Bozeman, June 12, 1916, [Mont. Agr. Exp. Sta.].

Oregon: 1 ♀, Corvallis, May 2, 1915, (A. L. Lovett), [Ore. Agr. Col.].

36. **Coenosia (Limosia) armiger** new species

Male pale grayish; head with face, parafacials, and cheeks whitish pruinescent; parafrontals darker; frontal vitta blackish, with trace of whitish pollen; second antennal segment grayish black with paler reddish area around distal margin; third antennal

segment with whitish pubescence; arista with basal thickening blackish; palpi blackish. Thorax and abdomen concolorous, pale grayish with bluish caste, with no markings; abdomen occasionally with trace of brownish infuscation along dorsum; basal sclerite of hypopygium concolorous with abdomen; ninth tergum (anal sclerite) and fifth sternum of darker shade, with whitish pollen. Legs largely yellow, fore coxae yellow, mid and hind coxae grayish; fore, mid and hind femora entirely yellow except for a trace of infuscation along dorsum of fore femur and at apex of mid and hind femora; hind tibia of a darker shade of yellow than femur, but not infuscated. Tarsi yellowish, the mid and hind pairs obscurely so, and more or less fuscous. Wings hyaline, veins yellowish; calyptrae whitish; halteres yellow.

Head with eyes separated by nearly one-third the width of head, when viewed from above; cephalic pair of parafrontal bristles weaker developed than caudal (median) pair; cephalic pair of ocellar bristles weakly developed, not longer than caudal pair; outer pair of vertical bristles well developed, equal in length to paraorbital bristles. Parafacials at base of antennae slightly protruded, in width equal to breadth of third antennal segment; cheeks about as high as width of third antennal segment, the latter longish, more than twice as long as length of second antennal segment, and extending ventrad to nearly the level of oral margin.

Thorax with a pair of longish presutural acrostical bristles, and with a stout spinulose pair of presutural dorsocentral setulae; humeral callosity with two stout spinules; notopleural bristles short, the posterior bristle spinelike.

Abdominal terga with weak bristles, the discal and marginal series similar in appearance; fifth sternum sparsely clothed with weak, fine setulae and bristles.

Fore femur with a sparse series of posteroventral and posterodorsal bristles, the median series reduced to 1 or 2 basal bristles; fore tibia with a weak mid posterior bristle, the apical posteroventral and apical posterodorsal bristles setulose; mid tibia with the mid anterodorsal bristle setulose, the mid posterior bristle short and fine, apical anteroventral and posteroventral bristles setulose; hind femur with no bristles on distal half of posteroventral surface, and with the bristles on proximal half of anteroventral surface shorter and finer than those on distal half; hind tibia with a mid anterodorsal bristle, apical anterodorsal bristle weakly developed; the apical mid dorsal and anterodorsal bristles approximated, situated on about the same transverse plane; with no apparent mid anteroventral bristle.

Length, 2.5 mm.

Female similar to male but darker gray, with brownish caste on mesonotum, and with trace of brownish markings on abdom-

inal terga. All coxae grayish, and all femora, except at distal margin, entirely blackish; hind tibiae slightly fuscous; tarsi blackish. Bristling of legs stronger than in male. Fore, mid, and hind tibiae with longish mid bristles; mid tibia with mid anterior bristle longer than mid posterior bristle, with apical posteroventral bristle longer than diameter of tibia where situated; hind tibia with a mid anteroventral bristle.

Length, 3 mm.

Type and *allotype*.—♂, ♀; Hull, Quebec, June 10, 1923, (C. H. Curran), [C.N.C.].

The sexes differ somewhat in coloration and structural characters, but I feel confident that they are conspecific. They agree in certain peculiar structural details and in the armature of head, thorax, and abdomen. In the male the fore coxae and all femora and tibiae are almost entirely yellow, whereas in the female all coxae and femora are almost entirely blackish, with the hind tibiae slightly fuscous. There are also notable differences in the chaetotaxy of the legs. The species is allied to those possessing short spinulose setulae on humeral callosity. The male resembles *oregonensis* in having all the femora largely yellow, but may be readily distinguished from this species by the chaetotaxy of hind tibia, and in coloration of antennae as indicated in the key. In certain respects the female resembles that of *pygmaea*, having the femora largely blackened, but it may be readily distinguished by the armature of humeral callosity, and in not having a spinular process at apex of dorsal (upper) surface of third antennal segment.

37. **Coenosia (Limosia) pallipes** Stein (Figs. 9, 35, 78)

Coenosia pallipes Stein, Berl. Ent. Zeitschr., (1897), XLII, p. 270, 1898. Stein, Arch. f. Naturgesch., LXXXIII, (1917), (A) hft. 1, p. 161, 1919. Stein, Arch. f. Naturgesch., LXXXIV, (1918), (A), hft. 9, p. 95, 1920. Malloch, Ent. News, XXXII, p. 204, 1921. Hallock, Circ. 103, N. J. Dept. Agric., p. 16, 1926.

Coenosia denticornis Malloch, Trans. Amer. Ent. Soc., XLVI, p. 164, 1920. Malloch, Ent. News, XXXII, p. 204, 1921. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 237, 1925. Frison, Bull. Ill. Nat. Hist. Surv., XVI, p. 197, 1927.

The species may be readily identified in the male sex in that the third antennal segment has a decidedly spinular process at apex of dorsal (upper) surface. In the female this character, though present, is not always distinctly apparent. The fore

coxae are partly yellowish in both sexes, and the mid and hind coxae blackish. In addition, the apical bristles on hind tibia are situated on about the same transverse plane, and the mid femur has only one preapical bristle on posterior surface.

The species resembles *pygmaea* in many of the above respects, but *pygmaea* has the fore coxae and all femora largely grayish black, and the fore and hind tibiae with infuscation on distal two-thirds; whereas in *pallipes* the mid and hind femora and all tibiae are entirely yellowish.

ALBERTA: 1 ♀, Lake Newell, June 9, 1923, (Walter Carter). 1 ♀, Banff, June 15, 1922, [all C.N.C.].

ILLINOIS: 1 ♀, Algonquin, July 8, 1894. 1 ♀, Sun Lake, Aug. 9, 1906, (Bog), [Ill. N.H.S.]. 1 ♀, McHenry, Aug. 21, 1927.

MANITOBA: 1 ♂, Treesbank, June 6, 1922, (H. A. Robertson). 1 ♀, Teulon, July 7, 1923. 1 ♀, Aweme, June 4, 1926, (R. M. White). 1 ♀, Baldur, July 20, 1926. 1 ♀, Onah, July 10, 1918, (N. Criddle). 1 ♀, Winnipeg Beach, July 2, 1923, (A. J. Hunter), [all C.N.C.].

MONTANA: 1 ♂, 1 ♀, Bozeman, June 27, 1906, [Mont. Agr. Exp. Sta.].

NORTH DAKOTA: 1 ♂, L. Metigosche, Turtle Mts., June 20, 1918. 1 ♀, Brookings, June 1, 1918.

ONTARIO: 1 ♂, Ottawa, June 14, (C. H. Curran), [C.N.C.].

QUEBEC: 1 ♀, Hemmingford, Aug. 29, 1916, (J. I. Beaulne). 1 ♀, Aylmer, Aug. 12, 1924, (C. H. Curran). 1 ♀, Roberval, July 28, 1915, (G. Beaulieu), [all C.N.C.].

VERMONT: 1 ♂, Manchester, June 6, 1910.

38. **Coenosia (Limosia) incisurata** van der Wulp (Figs. 18, 45, 75)

Coenosia incisurata van der Wulp, Tijsch. Ent., XII, p. 86, 1869. Stein, Arch. f. Naturgesch., LXXXIII, (1917), (A), hft. 1, p. 160, 1919.

Coenosia flavicoxa Stein, Berl. Ent. Zeitschr., (1897), XLII, p. 271, 1898. Smith, Ann. Rept. N. J. State Museum 1909, p. 793, 1910. Stein, Arch. f. Naturgesch., LXXXIII, (1917), (A), hft. 1, p. 159, 1919. Stein, Arch. f. Naturgesch., LXXXIV, (1918), (A), hft. 9, pp. 95, 104, 1920. Malloch, Ent. News, XXXII, pp. 203, 204, 1921. Cole and Lovett, Proc. Cal. Acad. Sci., XI, p. 314, 1921. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 237, 1925. Huckett, Mem. 101 N. Y. (Cornell) Agr. Exp. Station, (1926), p. 835, 1928.

The female specimen under *incisurata* in the van der Wulp collection of the 'S Rijks Museum at Leiden was collected in Wisconsin, and the species is undoubtedly the same as *flavicoxa* Stein.

The species bears a superficial resemblance to *oregonensis* and *argenticeps*, from which it may be readily distinguished in the male sex by the blackish color of antennae and palpi, and, in both

sexes by the normal setulose appearance of the humeral vestiture and of the presutural pair of dorsocentral setulae. In addition, the antennae in *incisurata*, especially in male, is noticeably short for this subgenus, the third antennal segment being scarcely longer than twice length of second antennal segment; the cheeks are broad, in height equal to three quarters length of third antennal segment; and the abdomen bears three pairs of prominent spots, which are seal brown in color.

British Columbia: 1 ♀, Oliver, June 25, 1923, (C. B. D. Garrett). 1 ♀, Nelson, July 21, 1927, (A. A. Dennys), [all C.N.C.].

Illinois: 1 ♂, 1 ♀, Meredosia, May 29, 1917, (sand pit). 1 ♀, Urbana, Nov. 21, 1913, (window), [all Ill. N.H.S.].

Manitoba: 1 ♂, Aweme, May 27, 1922, (H. A. Robertson), [C.N.C.].

New Jersey: 1 ♀, Atison, Aug. 27, 1925, (H. C. Hallock), [H.C.H.].

New York: 1 ♂, 1 ♀, Karner, May 23, 1912. 1 ♂, Ithaca, Aug. 6, 1903, 1 ♀, May 23, 1920; 1 ♀, Aug. 7, 1903; 2 ♀, May 24, 1913. 1 ♂, 3 ♀, Sport Island, Sacondaga River, (C. P. Alexander). 1 ♂, Peru, June 21, 1914. 1 ♀, Wells, July 26, 1923, (D. B. Young). 1 ♀, Wilmington, Essex County, Aug. 20–23, 1916 (1000–2000 ft. alt.). 1 ♂, Riverhead, Long Island, May 22, 1927; 1 ♀, May 7, 1923; 2 ♂, May 8, 1927; 1 ♀, Oct. 23, 1927; 2 ♀, Sept. 26, 1927; 1 ♀, Aug. 10, 1927; 2 ♀, May 22, 1927, [H.C.H.].

Nova Scotia: 1 ♀, Truro, Sept. 15, 1913, (R. Matheson), [C.U.].

Ontario: 1 ♂, Ottawa, June 18, 1916. 1 ♀, Mer Bleue, June 22, 1916. 1 ♀, Niagara Glen, June 15, 1926. 1 ♀, Whitby, July 6, 1926, (G. S. Walley), [all C.N.C.].

Oregon: 1 ♂, 1 ♀, Hood River, (Childs), [Ore. Agr. Col.].

Quebec: 1 ♂, 1 ♀, Meach Lake, June 21, 1916.

Washington: 1 ♂, Lake Chelan, Stehekin, July 30, 1919. 1 ♂, Klickitat River, Glenwood Road, July 23, 1921. 1 ♀, Entiat, July 26, 1919, (A. L. Melander), [all A.L.M.].

39. **Coenosia (Limosia) candida** new species

The male of the species may be recognised by its pale bluish gray color, resembling superficially in this respect *argenticeps;* by the ventral curvature of the abdomen; and by the reddish yellow color of the ninth tergum (anal sclerite). The head of male and female, when viewed in profile, is peculiarly shaped in that the dorsal surface is flattened, thereby rendering the eye broad dorsad, i.e., in that region above the level of attachment of antennae, and much narrower ventrad of this level. In the male the margin of eye bordering the parafacials is slightly concave in outline. In the female the abdomen has paired brownish spots on terga 3 and 4, but not on tergum 5, and the wings are tinged with yellow.

Male pale gray, with whitish pruinescence; frontal vitta light brownish pruinescent, with trace of reddish at base of antennae; face, parafacials, and cheeks densely silvery pruinescent; second antennal segment grayish infuscated with more or less yellowish tinge; third antennal segment grayish on distal half, the proximal region pale yellow; palpi yellowish apicad, fuscous basad; proboscis brownish, polished. Thorax and abdomen concolorous, grayish black with whitish pruinescence, with no markings on mesonotum or terga; basal sclerite of hypopygium concolorous with abdomen; ninth tergum (anal sclerite) reddish yellow; fifth sternum more or less yellowish. Legs, including coxae, entirely yellow, tarsi brownish, pulvilli tinged. Wings with veins yellowish brown, membrane clear; calyptrae whitish; halteres pale yellow.

Head slightly flattened above, the frontal margin of eye angular in outline, the dorsal half of eye broader than ventral half, the latter gradually tapering ventrad. Anterior pair of ocellar bristles strongly developed, equal in length to parafrontal bristles; outer pair of vertical bristles longish; third antennal segment scarcely twice as long as second segment, extending ventrad to about two-thirds length of face. Cheeks slightly higher than breadth of third antennal segment, ventral margin of eye extending to about level with oral vibrissae, marginal bristles of cheeks longish.

Humeral callosities with setulae erect and spinulose, similar in structure to the postorbital setulae; mesonotum with the presutural pair of dorsocentral setulae spinulose, and with one or two pairs of fine longish presutural acrostical bristles.

Abdomen recurved in outline, the caudal segments curved ventrad; discal series of bristles well developed though the bristles are not robust; fifth tergum with a series of well developed marginal bristles; fifth sternum broadly emarginate, with fine bristles and longish setulae.

Legs slender, fore tibia with a fine bristle at middle of posterior surface, apical posteroventral bristle setulose; mid femur with a series of three bristles on proximal third of anteroventral and posteroventral surfaces; mid tibia with a fine bristle at middle of anterior and posterior surfaces, apical posteroventral bristle nearly equal in length to diameter of tibia where situated; hind femur with a widely spaced series of three or four anteroventral bristles, posteroventral surface with three fine slender bristles on proximal half, the bristles not as strongly developed as those on posteroventral surface of mid femur: hind tibia with a well developed mid anterodorsal and apical mid dorsal bristle, with a bristle at middle of anteroventral surface, apical anterodorsal bristle short, scarcely as long as apical anteroventral bristle. Claws finely developed. Wings longish.

Length, 5 mm.

Female slightly darker than male; head grayish; face, parafacials, and cheeks whitish pruinescent; second antennal segment reddish fuscous, third antennal segment largely black, with trace of reddish at base on inner surface; palpi paler proximad, fuscous distad. Thorax and abdomen grayish pruinescent. Mesonotum with trace of vittae; abdomen with faint brownish spots on terga 3 and 4. Fore femur with trace of bluish black infuscation along dorsal surface; tarsi brownish. Wings with yellowish tinge.

Structurally similar to male. Abdominal bristles finely developed, discal bristles about as long as marginal bristles. Fore tibia with a well developed apical posteroventral bristle; mid tibia with mid anterior bristle slightly stronger and longer than mid posterior bristle, apical posteroventral bristle about as long as diameter of tibia where situated; halteres yellow.

Length, 5.5 mm.

Type and allotype.—♂, ♀; Ilwaco, July 12, 1922, (A. L. Melander), [U.S.N.M.].

Additional material from:

WASHINGTON: 1 ♀, Ilwaco, July 7, 1918, (A. Spuler); 1 ♀, July 17, 1922. 1 ♀, Olympia, July 17, 1922, (A. L. Melander), [all A.L.M.].

40. **Coenosia (Limosia) maculiventris** new species

Male similar to that of *candida*, differing in that the abdomen has four pairs of longish black marks; the lower calyptrae are not as long as halteres, smallish and tapering distad; the apical anterodorsal bristle of hind tibia is robust and is longer than apical anteroventral bristle; whereas in *candida* the abdomen is unmarked, the lower calyptrae are proportionately large and as long as halteres; the apical anterodorsal bristle of hind tibia is not strongly developed, and is shorter than apical anteroventral bristle. Length, 3.5 mm. The female is more difficult to distinguish from that of *candida* than in the case of the males. The species is smaller than *candida;* the lower calyptrae are not as large in proportion to the size of the upper scale; the abdomen has paired markings on terga 3, 4, and 5.

Length, 4 mm.

Type and *allotype.*—♂, ♀; Ilwaco, July 12, 1922, Washington, (A. L. Melander), [U.S.N.M.].

Additional material from:

WASHINGTON: 1 ♀, Skyline trail, Mt. Baker, Aug. 10, 1925. 1 ♀, Lake Crescent, Fairholm, July 26, 1917. 1 ♀, Canyon Creek, July 26, 1925. 2 ♀, Nooksack River, Mt. Baker, Aug. 11, 1925. 1 ♀, forest near Olympia, July 28, 1917, (A. L. Melander), [all A.L.M.].

41. **Coenosia (Limosia) impunctata** Malloch

Coenosia impunctata Malloch, Trans. Amer. Ent. Soc., XLVI, p. 165, 1920. Malloch, Ent. News, XXXII, p. 204, 1921.

The male superficially resembles that of *atrata*, differing essentially in that the fore coxae are yellowish, the apical posterodorsal bristle on fore tibia is setulose, and the abdominal bristles are much weaker developed than in that species. In the female the fore coxae are largely blackish, and all the femora are largely blackened, as in *nigrescens*, but from the females of that species those of *impunctata* may be distinguished by the weaker abdominal bristles, and the setulose nature of apical posterodorsal bristle on fore tibia.

ALASKA: 1 ♂, Katmai, June 10, 1919, 1 ♀, Aug. 1917, (J. S. Hine), [H.C.H.]. WASHINGTON: 1 ♀, Big 4 Mt., July 5, 1924, (A. L. Melander).

In the above male specimen of *impunctata* the length of apical posteroventral bristle of mid tibia is about equal to the diameter of tibia where situated, hence, as a precaution to its correct determination in the key, I have included the species under both captions specifying this character.

42. **Coenosia (Limosia) pedella** (Fallén) (Figs. 7, 34, 72)

Musca pedella Fallén, Dipt. Suec., Muscides, p. 88, 1825.
Coenosia pedella Meigen, Syst. Beschr., v, p. 216, 1826.
Coenosia decipiens Meigen, Syst. Beschr., v, p. 218, 1826.
Coenosia incompta Meigen, Syst. Beschr., VII, p. 335, 1838.
Anthomyza pumila var. *B.* Zetterstedt, Ins. Lapponica, p. 694, 1840.
Anthomyza pedella Zetterstedt, Ins. Lapponica, p. 693, 1840.
Anthomyza decipiens Zetterstedt, Dipt. Scand., IV, p. 1735, 1845.
Centriocera decipiens Pokorny, Verh. zool.-bot. Ges. Wien, XLIII, p. 537, 1893.
Coenosia croceimana Pandellé, Rev. Ent. France, XVIII, p. 150, 1899.
Coenosia dichaeta Malloch, Trans. Amer. Ent. Soc., XLVI, p. 163, 1920. Malloch, Ent. News, XXXII, p. 202, 1921.

The species may be readily recognised on account of the weak development of the apical pair of scutellar bristles, which in some specimens is entirely absent. The wings are decidedly broadened distad, and the costa has a series of longish semierect setulae. In addition, the first, second, and third tarsal segments of the fore legs, in the male, are yellow in color, whereas the mid and hind tarsal segments are fuscous. In the female all tarsi and all femora are blackish.

ALBERTA: 1 ♀, Waterton, July 13, 1923, (H. L. Seamans), [C.N.C.].
BRITISH COLUMBIA: 1 ♀, Rolla, July 1, 1927, (P. N. Vroom), [C.N.C.].

Colorado: 1 ♂, Geneva Park, alt. 9500–10000 ft., Grant, July 22, 1918, (E. C. Jackson), [U.S.N.M.].

Montana: 1 ♂, Bozeman, July 1, 1916, [Mont. Agr. Exp. Sta.].

North West Territories: 1 ♂, 1 ♀, Fort Simpson, McKenzie River, June 25, 1922. 1 ♂, Fort Wrigley, McKenzie River, July 23, 1922, (C. H. Crickmay), [all C.N.C.].

Quebec: 1 ♂, Natashquan, Aug. 1, 1929, (W. J. Brown), [C.N.C.]. 1 ♀, Anticosti Isle, Aug. 6, 1923, (F. Johansen).

Saskatchewan: 1 ♂, Lacadena, July 4, 1923, (K. M. King). 1 ♀, Roadene, July 5, 1923, (K. M. King), [all C.N.C.].

43. **Coenosia (Limosia) compressa** Stein (Figs. 10, 37, 67)

Coenosia compressa Stein, Ann. Mus. Nat. Hungarici, II, p. 489, 1904. Stein, Arch. f. Naturgesch., LXXXIII, (1917), (A), hft. 1, p. 159, 1919. Malloch, Ent. News, XXXII, p. 202, 1921. Johnson, Occ. Pap. Boston Soc. Nat. Hist., VII, p. 237, 1925. Johnson, Insect Fauna, Biol. Surv. Mt. Desert Region, p. 211, 1927. Huckett, Mem. 101 N. Y. (Cornell) Agr. Exp. Station, (1926), p. 835, 1928.

In certain respects this species superficially resembles *flavifrons* Stein, notably in the appearance of the hypopygium and fifth abdominal sternum in male, and in the bristling of the legs. In *flavifrons* however the frons is covered with a brassy sheen, whereas in *compressa* the frons is grayish or whitish pruinescent. There is a considerable degree of variation in the coloration of abdomen and thorax in both sexes, from almost entirely grayish black to largely yellow. From closely related forms the species may be distinguished by the presence of a short preapical bristle on posteroventral surface of mid and hind femora. The yellowish forms of *compressa*, in the male sex, resemble *Hoplogaster nigritarsis* Stein, from which it differs in having a larger lower calyptra, a more pronounced development of the ninth tergum (anal sclerite), which is almost devoid of setulae dorsad, whereas in *nigritarsis* the ninth tergum is inconspicuous in structure and vestiture, the basal sclerite of hypopygium being prominently developed.

Massachusetts: 1 ♂, 1 ♀, Petersham, July 30, 1926, (A. L. Melander), [A.L.M.].

Minnesota: 1 ♂, 1 ♀, Duluth, St. Louis Co., Aug. 6–8, 1912, (Witmer Stone), [A.N.S.P.].

New Brunswick: 1 ♀, Greys Mills, Sept. 8, 1922, (R. P. Gorham), [C.N.C.].

New Hampshire: 1 ♂, Benton, July 6, 1931, (A. L. Melander), [A.L.M.].

New York: 2 ♀, Shelving Rock Bridge, Lake George, Sept. 2, 1920. 1 ♀, Black Mt., Lake George, Sept. 4, 1920. 1 ♀, Adirondack Lodge, June 28, 1923, (M. D. Leonard). 1 ♂, Avalanche Trail, Adirondacks, July 30, 1929, (A. L. Melander). 1 ♀, Fish Creek, Adirondacks, Aug. 2, 1929, (A. L. Melander). 1 ♀, Boston, July 10, 1910, (M. C. VanDuzee). 1 ♀, McLean, Sept. 11, 1920. 1 ♀, Keene Valley, Aug. 10, 1916, (E. L. Diven). 1 ♀, Ithaca, Aug. 1, 1920, [H.C.H.].

Nova Scotia: 1 ♀, West River, July 29, 1913. 1 ♀, Truro, Aug. 12, 1913, (R. Matheson), [C.U.].

Ontario: 1 ♂, 1 ♀, Muskoka, Aug. 1925, (H. S. Parish). 1 ♂, Norway Point, Lake of Bays, Aug. 1, 1919, (J. McDunnough). 1 ♀, Burke Falls, July 13, 1926, (F. P. Ide). 1 ♂, 1 ♀, Waubamick, July 1915, (H. S. Parish), [all C.N.C.].

Quebec: 1 ♂, 1 ♀, Knowlton, July 5, 1927. 1 ♀, Covey Hill, June 25, 1927, (W. J. Brown), [C.N.C.]. 1 ♂, East Bolton, July 22, 1911, (A. F. Winn). 1 ♀, Sherbrooke, July 5, 1916, (W. T. M. Forbes), [H.C.H.].

Wisconsin: 1 ♀, Brule River, Douglass County, Aug. 23, 1912, (Witmer Stone), [A.N.S.P.].

There are a number of specimens which are typical of *compressa* except that they possess the third antennal segment and palpi largely blackish instead of largely yellowish. I have treated these forms as a variety of this species.

Slosson (44) and subsequent authors have recorded the occurrence of *Caricea albicornis* (Meigen) in North America. I am of the opinion that such records relate to *compressa* or *nigritarsis*, and that, so far as I know, *albicornis* has yet to be found.

44. **Coenosia (Limosia) compressa** var. **conforma** new variety
(Figs. 11, 38, 68)

Male and female similar to those of *compressa*, except that the third antennal segment is largely infuscated and the palpi are largely blackish, paler basad. The cephalic pair of ocellar bristles are well developed, as strong and as long as the cephalic pair of parafrontal bristles. Thorax and abdomen entirely grayish black, except for the sternal sclerites and, in male, the copulatory appendages, which are more or less yellowish testaceous.

Type and allotype.—♂, ♀; Onah, Manitoba, Aug. 6, 1927, [C.N.C.].

Additional material from:

British Columbia: 1 ♀, Minnie Lake, July 27, 1925, (H. G. Crawford), [C.N.C.]. 1 ♂, Downie Creek, Selkirk Mts., Aug. 9, 1905, (J. C. Bradley), [C.U.].

Minnesota: 1 ♀, Duluth, St. Louis Co., Aug. 6–8, 1912, (Witmer Stone), [A.N.S.P.].

Nova Scotia: 1 ♀, West River, July 23, 1913, [C.U.].
Ontario: 1 ♂, Sudbury, May 12, 1889, [C.N.C.].
Quebec: 1 ♂, Natashquan, Aug. 7, 1929, (W. J. Brown), [C.N.C.].
Wisconsin: 3 ♀, Brule River, Douglass County, Aug. 23, 1912, (Witmer Stone), [A.N.S.P.].

The above specimens are no doubt a color variety of *compressa*, the distinction being based largely on the infuscation of antennae and palpi. I can find no specific structural differences in the male genitalia of the two forms. There are considerable variations in structure and coloration within the range of each form, but in *conforma* the cephalic pair of ocellar bristles are invariably strongly developed, and the thorax and abdomen are grayish black, whereas in *compressa* the cephalic pair of ocellar bristles are frequently weakly developed, and the thorax and abdomen occasionally largely yellowish.

45. **Coenosia (Limosia) triseta** Stein (Figs. 12, 39, 70)

Coenosia triseta Stein, Berl. Ent. Zeitschr., (1897), xlii, p. 262, 1898. Smith, Ann. Rept. N. J. State Museum 1909, p. 793, 1910. Stein, Arch. f. Naturgesch., lxxxiii, (1917), (A), hft. 1, p. 162, 1919. Stein, Arch. f. Naturgesch., lxxxiv, (1918), (A), hft. 9, pp. 94, 105, 1920.

Macrocoenosia triseta Malloch, Trans. Amer. Ent. Soc., xlvi, p. 162, 1920. Johnson, Occ. Pap. Boston Soc. Nat. Hist., vii, p. 238, 1925. Johnson, Insect Fauna, Biol. Surv. Mt. Desert Region, p. 211, 1927. Huckett, Mem. 101 N. Y. (Cornell) Agr. Exp. Station, (1926), p. 836, 1928.

This species was proposed by Malloch (18) as the type of his newly formed genus *Macrocoenosia*. I have preferred at present to include the species among those of *Limosia*, since I find the characters cited in defining the genus of uncertain value, there being many species in this genus having the abdominal and hind tibial characters of *Macrocoenosia*, and which moreover belong to more than one segregate within the genus.

The male has the strong femoral and tibial bristling and stout tarsal development of *compressa* and *flavifrons*, but from the male of these species it may be distinguished by the presence of a short bristle on anterodorsal surface of fore tibia, a strong bristle at middle of posterodorsal surface of hind tibia, and by the dense series of long erect bristles on the processes of fifth abdominal sternum, which extend from base to apex.

The female differs from that of *flavifrons* and *compressa* as in the male, except for the secondary sexual characters on the fifth

abdominal sternum. However in both *flavifrons* and *compressa* the hind tibia possesses a setulose bristle at middle of posterodorsal surface. In addition, in *flavifrons* the coxae are largely blackish, and in *compressa* the hind femur has a short apical bristle on posteroventral surface, whereas in the female of *triseta* the coxae are entirely yellowish, and the hind femur has no apical posteroventral bristle.

ALBERTA: 1 ♂, 1 ♀, Nordegg, July 5, 1921, (J. McDunnough). 1 ♀, Lethbridge, June 27, 1923, [C.N.C.].

MASSACHUSETTS: 1 ♀, North Bedford. 1 ♀, North Andover, Sept. 24, 1910, (J. D. Tothill), [U.S.N.M.].

NEW BRUNSWICK: 1 ♀, Greys Mills, Sept. 8, 1922, (R. P. Gorham). 1 ♀, Barberd, June 25, 1914, (J. D. Tothill). 1 ♀, Gorish, July 11, 1913, [all C.N.C.].

NEWFOUNDLAND: 2 ♀, Grand Lake, Aug. 1, 1906, [U.S.N.M.].

NEW YORK: 1 ♂, North Fairhaven, Aug. 13, 1921. 1 ♂, McLean, July 2–3, 1904. 1 ♂, Montezuma Marsh, Cayuga, July 1, 1920. 1 ♂, Riverhead, Long Island, Aug. 14, 1927. 1 ♂, 1 ♀, Hempstead, Long Island, April 10, 1921. 1 ♀, Riverhead, Long Island, June 27, 1926. 1 ♀, Southold, Long Island, June 13, 1926. 1 ♀, Searingtown, Long Island, Sept. 19, 1921. 1 ♀, North Chatham, June 6, 1902. 1 ♀, Wilmington, Essex County, Aug. 20–25, 1916, alt. 1000–2000 ft. 1 ♀, Wells, July 23, 1923, (D. B. Young) 1 ♀, Speculator, July 20, 1909. 2 ♂, Fine, Aug. 3, 1929, (A. L. Melander), [H.C.H.].

NOVA SCOTIA: 1 ♀, Annapolis, Oct. 1, 1924, (R. P. Gorham), [C.N.C.].

ONTARIO: 1 ♂, Sand Lake, July 2, 1926, (F. P. Ide). 1 ♂, 1 ♀, Mer Bleue, Ottawa, May 28, 1897, (G. S. Walley); 1 ♂, 1 ♀, June 7, 1923, (C. H. Curran). 3 ♀, Putnam, June 26, 1925, (G. S. Walley). 1 ♀, Low Bush, Lake Abitibi, June 21, 1925, (N. K. Bigelow). 1 ♀, Strathroy, July 5, 1925, (H. F. Hudson). 1 ♀, Burke Falls, July 13, 1926, (F. P. Ide). 1 ♀, Chalk River, Aug. 26–27, 1919, (R. N. Chrystal). 1 ♂, 1 ♀, Waubamick, June 1915, (H. S. Parish), [all C.N.C.].

PENNSYLVANIA: 1 ♂, Pocono Lake, July 23, 1911, [A.N.S.P.].

QUEBEC: 1 ♂, 1 ♀, Roberval, July 28, 1915, (G. Beaulieu). 1 ♂, 1 ♀, Mutton Bay, July 11, 1929. 1 ♂, 1 ♀, Natashquan, Aug. 7, 1929. 1 ♂, Knowlton, June 21–22, 1927. 1 ♀, Bradore Bay, July 26, 1929. 1 ♀, Kazubazua, Aug. 18, 1927. 1 ♀, Covey Hill, June 25, 1927. 1 ♀, Mecotina Sanctuary, July 8, 1929, (W. J. Brown). 1 ♀, Algonquin Park, July 28, 1922. 1 ♀, Hemmingford, June 20, 1923, (C. E. Petch), [all C.N.C.].

46. **Coenosia (Limosia) toshua** new species

The species possesses a short bristle at middle of posterodorsal surface of hind tibia, which in the female is apt to be weakly developed. By this character the species may be associated with *triseta*. It is however much smaller than Stein's species, and

differs further in having no bristle at middle of anterodorsal surface of fore tibia, and no markings on abdominal terga.

The species resembles *dorsovittata*, but that species has no bristle at middle of posterior surface of hind tibia, and the discal bristles on abdominal terga are much weaker; in addition, the mid femur of *dorsovittata* has a preapical bristle on anterior surface, which is lacking in *toshua*.

Male pale grayish, densely pruinescent, opaque, with no markings on mesonotum or terga: head, thorax, and abdomen concolorous; head with parafacials, cheeks, and face light grayish pruinescent; frontal vitta blackish with whitish pollen; second antennal segment densely grayish pruinescent, with reddish tinge along apical margin; third antennal segment with grayish pubescence; proboscis polished; palpi blackish. Ninth abdominal tergum (anal sclerite) and fifth sternum blackish, not so densely grayish pruinescent as abdominal terga. Legs yellow, fore coxae entirely yellow, mid coxae grayish tinged basad, hind coxae largely grayish. All femora and all tibiae entirely yellow; basitarsi yellowish, tarsal segments 2 to 5 more or less fuscous. Calyptrae whitish; wings hyaline, veins yellowish; halteres pale yellow.

Head with parafacials at base of antennae rather noticeable, as wide as height of cheek, with one or two accessory setulae; third antennal segment about twice as long as second segment, reaching a level with lower fifth of face, and with ventral margin of eye; arista sparsely but distinctly pubescent throughout.

Abdominal terga with strongly developed discal bristles; fifth abdominal sternum deeply cleft, the processes clothed with longish bristles and setulae from base to apex; ninth tergum (anal sclerite) subglobose as in *errans*, with the anal membrane restricted to small proportions.

Fore coxa with a basal series of three or four discal bristles on anterior surface. All femora stoutly developed. Fore tibia with a bristle at middle of posterior surface, with four apical bristles, of which the posteroventral and dorsal bristles are stronger developed than the apical anterodorsal and posterodorsal bristles. Mid tibia with a bristle at middle of anterior and posterior surfaces, situated about the same level, the former longer than the latter; with a well developed dorsal apical bristle, and with a slightly weaker developed apical posterodorsal bristle, the apical posteroventral bristle strongly developed, longer than diameter of tibia where situated. Hind tibia with one anteroventral, one anterodorsal, and a short bristle at middle of posterior surface; with apical dorsal and anterodorsal bristles approximate, situated on nearly the same transverse plane. Wings with *m-cu*

cross vein straight and erect; costa with a noticeable series of semierect setulae.

Length, 3.5 mm.

Female similar to male, with no markings on thorax or abdomen, differing only in sexual characters; fore coxae with grayish tinge at extreme base; mid and hind coxae more extensively grayish than in male. Tarsi blackish.

Length, 4 mm.

Type and *allotype*.—♂, ♀; Elkhorn, Aug. 9, 1922, Manitoba, Canada, (N. Criddle), [C.N.C.].

Additional material from:

MANITOBA: 1 ♂, Stony Mt., Aug. 9, 1923, (J. B. Wallis), [C.N.C.].

ONTARIO: 1 ♀, Lake Abitibi, Low Bush, July 29, 1925, (N. K. Bigelow), C.N.C.].

47. **Coenosia (Limosia) rubrina** new species

The male of this species may be separated from those of related forms on account of the reddish appearance of the parafacials and cheeks. The thorax, abdomen, and legs resemble those of *incisurata*, but from that species *rubrina* may be distinguished by the yellowish color of third antennal segment, the stronger development of the apical posteroventral bristle of mid tibia, and by the narrower cheeks.

Male head with parafrontals grayish pruinescent; frontal vitta blackish with brownish pruinescence; parafacials, face, and cheeks reddish with whitish pruinescence; occipital region grayish black; third antennal segment entirely yellowish; second antennal segment fuscous basad, reddish along distal border; arista fuscous, yellowish basad; palpi reddish yellow. Thorax grayish black, tinged with brownish pollen on mesonotum, and with three brownish vittae. Abdomen concolorous with thorax, with three pairs of brownish spots on terga 3, 4, and 5 respectively; terga 1 + 2 with trace of brownish spots; ventral aspect of abdomen reddish testaceous in part; hypopygium grayish black; processes of fifth sternum reddish in part. Legs entirely yellowish, except for the fifth tarsal segments, which are yellowish brown; pulvilli whitish. Wings tinged with yellow, veins yellowish brown; halteres with knobs pale, whitish.

Eyes separated by a distance slightly greater than length of third antennal segment; eyes large, the ventral margin reaching ventrad to a level with oral vibrissae; parafacials, when viewed in profile, reduced to lineal dimensions, at base of antennae not broader than width of third antennal segment; cheeks not higher

than width of third antennal segment; oral vibrissae strongly developed; third antennal segment not longer than twice length of second segment; arista minutely pubescent.

Thorax with posthumeral bristle weakly developed, shorter than anterior notopleural bristle.

Abdomen similar in appearance to that of *incisurata*, cylindrical, with hypopygium inconspicuous; terga 3, 4, and 5 with well marked spots. Abdominal bristles short; fifth sternum deeply incised, processes with numerous fine bristles and longish setulae.

Legs slender; fore tibia with no bristle at middle of posterior surface, apical posterodorsal bristle setulose; mid femur with a preapical bristle on anterior surface; mid tibia with a short bristle at middle of anterior and posterior surfaces, the former situated considerably distad of the latter, apical posteroventral bristle but little longer than diameter of tibia where situated; hind femur with the bristles on antero- and posteroventral surfaces much finer basad; hind tibia with strongly developed bristle at middle of anterodorsal surface and at apex of dorsal surface, in contrast to which the bristle at middle of anteroventral surface is finely developed. Pulvilli short, the fore pair longer than those of mid and hind legs.

Length, 4.5 mm.

Type.—♂; Cuyamaca Mountains, San Diego County, California, Aug. 16, 1914, (J. C. Bradley), [H.C.H.].

48. **Coenosia (Limosia) johnsoni** Malloch (Figs. 13, 40, 69)

Coenosia johnsoni Malloch, Trans. Amer. Ent. Soc., XLVI, p. 167, 1920. Malloch, Ent. News, XXXII, p. 203, 1921.

The species closely resembles *sexnotata*, from which it may be separated in the male by the development of the bristles comprising the anteroventral series of hind femur. In *johnsoni* the basal bristle is much longer than the apical bristle of anteroventral series on hind femur, whereas in *sexnotata* the basal bristles are no longer than the apical bristles in such series.

In both the male and female of *johnsoni* the coxae are largely yellowish, especially the fore pair, whereas in *sexnotata* the coxae are grayish infuscated, or largely suffused with grayish coloration.

ALBERTA: 1 ♂, Waterton, July 13, 1923, 1 ♀, July 15, 1923, (H. L. Seamans). 1 ♀, Banff, Aug. 12, 1922, (C. B. D. Garrett). 1 ♀, Jasper, July 25, 1923, (J. McDunnough), [all C.N.C.].

BRITISH COLUMBIA: 1 ♀, Minnie Lake, July 27, 1925, (H. G. Crawford). 1 ♀, Salmon Arm, Aug. 15, 1925, (A. A. Dennys). 1 ♀, Keremeos, July 30,

1923, (C. B. D. Garrett). 1 ♀, Seton Lake, Lillooet, May 30, 1926, (J. McDunnough), [all C.N.C.].

ONTARIO: 1 ♂, Lake Abitibi, Low Bush, July 20, 1925, (N. K. Bigelow). 1 ♀, Orillia, June 10, 1925, (C. H. Curran). 1 ♀, Burke Falls, July 9, 1926, (F. P. Ide), [all C.N.C.].

QUEBEC: 1 ♀, Natashquan, Aug. 5, 1929. 1 ♀, Bradore Bay, July 27, 1929, (W. J. Brown), [C.N.C.].

In the above series of female specimens there is a considerable degree of variation in the intensity and extent of femoral infuscation. In the specimens from Quebec the femora are heavily infuscated throughout the distal half, whereas in specimens from Ontario and British Columbia the femoral infuscation is not so intensive. Some of the female specimens have the abdominal spots almost indistinguishable, whilst others, notably those from Quebec, have such spots large and intensively marked. One of the male specimens from Lake Abitibi has the abdominal spots indistinct, being merged in a brownish infuscation which extends throughout the median third of abdominal terga.

EXPLANATION OF PLATES

PLATE IX

Dorsal or caudal aspect of male copulatory appendages

Fig. 1.—*Coenosia* (*Limosia*) *cilicauda* Malloch
Fig. 2.—*Coenosia* (*Limosia*) *errans* Malloch
Fig. 3.—*Coenosia* (*Limosia*) *lata* Walker
Fig. 4.—*Coenosia* (*Limosia*) *bonita* new species
Fig. 5.—*Coenosia* (*Limosia*) *atrata* Walker
Fig. 6.—*Coenosia* (*Limosia*) *fraterna* Malloch
Fig. 7.—*Coenosia* (*Limosia*) *pedella* (Fallén)
Fig. 8.—*Coenosia* (*Limosia*) *aliena* Malloch
Fig. 9.—*Coenosia* (*Limosia*) *pallipes* Malloch
Fig. 10.—*Coenosia* (*Limosia*) *compressa* Malloch
Fig. 11.—*Coenosia* (*Limosia*) *compressa conforma* new variety
Fig. 12.—*Coenosia* (*Limosia*) *triseta* Stein

PLATE X

Dorsal or caudal aspect of male copulatory appendages

Fig. 13.—*Coenosia* (*Limosia*) *johnsoni* Malloch
Fig. 14.—*Coenosia* (*Limosia*) *nudiseta* Stein
Fig. 15.—*Coenosia* (*Limosia*) *tausa* new species
Fig. 16.—*Coenosia* (*Limosia*) *furtiva* new species

Fig. 17.—*Coenosia* (*Limosia*) *frisoni* Malloch
Fig. 18.—*Coenosia* (*Limosia*) *incisurata* van der Wulp
Fig. 19.—*Coenosia* (*Limosia*) *perspicua* new species
Fig. 20.—*Coenosia* (*Limosia*) *fuscifrons* Malloch
Fig. 21.—*Coenosia* (*Limosia*) *pilosissima* Stein
Fig. 22.—*Coenosia* (*Limosia*) *oregonensis* Malloch
Fig. 23.—*Coenosia* (*Limosia*) *argenticeps* Malloch
Fig. 24.—*Coenosia* (*Limosia*) *setigera* Malloch
Fig. 25.—*Coenosia* (*Limosia*) *albibasis* Stein
Fig. 26.—*Coenosia* (*Limosia*) *anthracina* Malloch

PLATE XI

Lateral aspect of male copulatory appendages

Fig. 27.—*Coenosia* (*Limosia*) *cilicauda* Malloch
Fig. 28.—*Coenosia* (*Limosia*) *errans* Malloch
Fig. 29.—*Coenosia* (*Limosia*) *lata* Walker
Fig. 30.—*Coenosia* (*Limosia*) *bonita* new species
Fig. 31.—*Coenosia* (*Limosia*) *tausa* new species
Fig. 32.—*Coenosia* (*Limosia*) *atrata* Walker
Fig. 33.—*Coenosia* (*Limosia*) *fraterna* Malloch
Fig. 34.—*Coenosia* (*Limosia*) *pedella* (Fallén)
Fig. 35.—*Coenosia* (*Limosia*) *pallipes* Stein
Fig. 36.—*Coenosia* (*Limosia*) *aliena* Malloch

PLATE XII

Lateral aspect of male copulatory appendages

Fig. 37.—*Coenosia* (*Limosia*) *compressa* Stein
Fig. 38.—*Coenosia* (*Limosia*) *compressa conforma* new variety
Fig. 39.—*Coenosia* (*Limosia*) *triseta* Stein
Fig. 40.—*Coenosia* (*Limosia*) *johnsoni* Malloch
Fig. 41.—*Coenosia* (*Limosia*) *nudiseta* Stein
Fig. 42.—*Coenosia* (*Limosia*) *furtiva* new species
Fig. 43.—*Coenosia* (*Limosia*) *perspicua* new species
Fig. 44.—*Coenosia* (*Limosia*) *frisoni* Malloch
Fig. 45.—*Coenosia* (*Limosia*) *incisurata* van der Wulp

PLATE XIII

Lateral aspect of male copulatory appendages

Fig. 46.—*Coenosia* (*Limosia*) *fuscifrons* Malloch
Fig. 47.—*Coenosia* (*Limosia*) *pilosissima* Stein

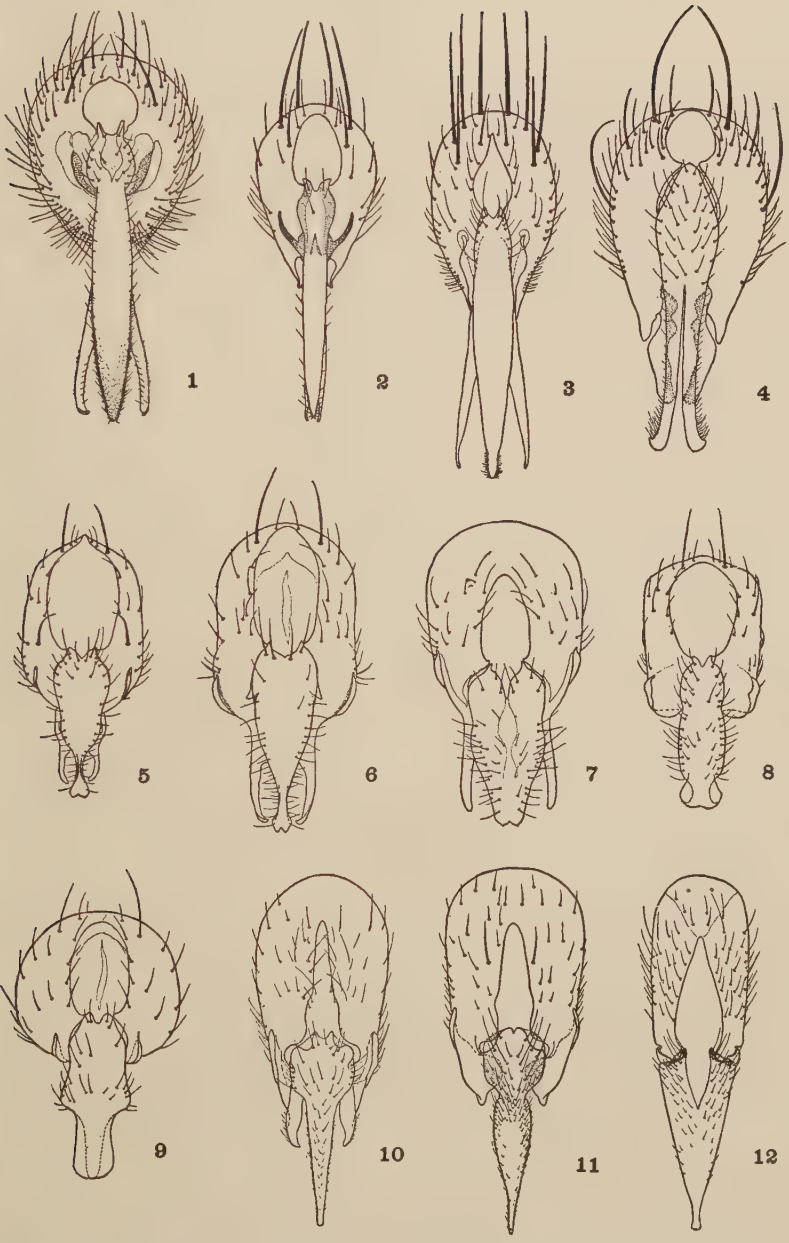
Fig. 48.—*Coenosia* (*Limosia*) *oregonensis* Malloch
Fig. 49.—*Coenosia* (*Limosia*) *argenticeps* Malloch
Fig. 50.—*Coenosia* (*Limosia*) *setigera* Malloch
Fig. 51.—*Coenosia* (*Limosia*) *albibasis* Stein
Fig. 52.—*Coenosia* (*Limosia*) *anthracina* Malloch

Lateral aspect of processes of fifth abdominal sternum in male (*in situ*)
Fig. 53.—*Coenosia* (*Limosia*) *antennalis* Stein

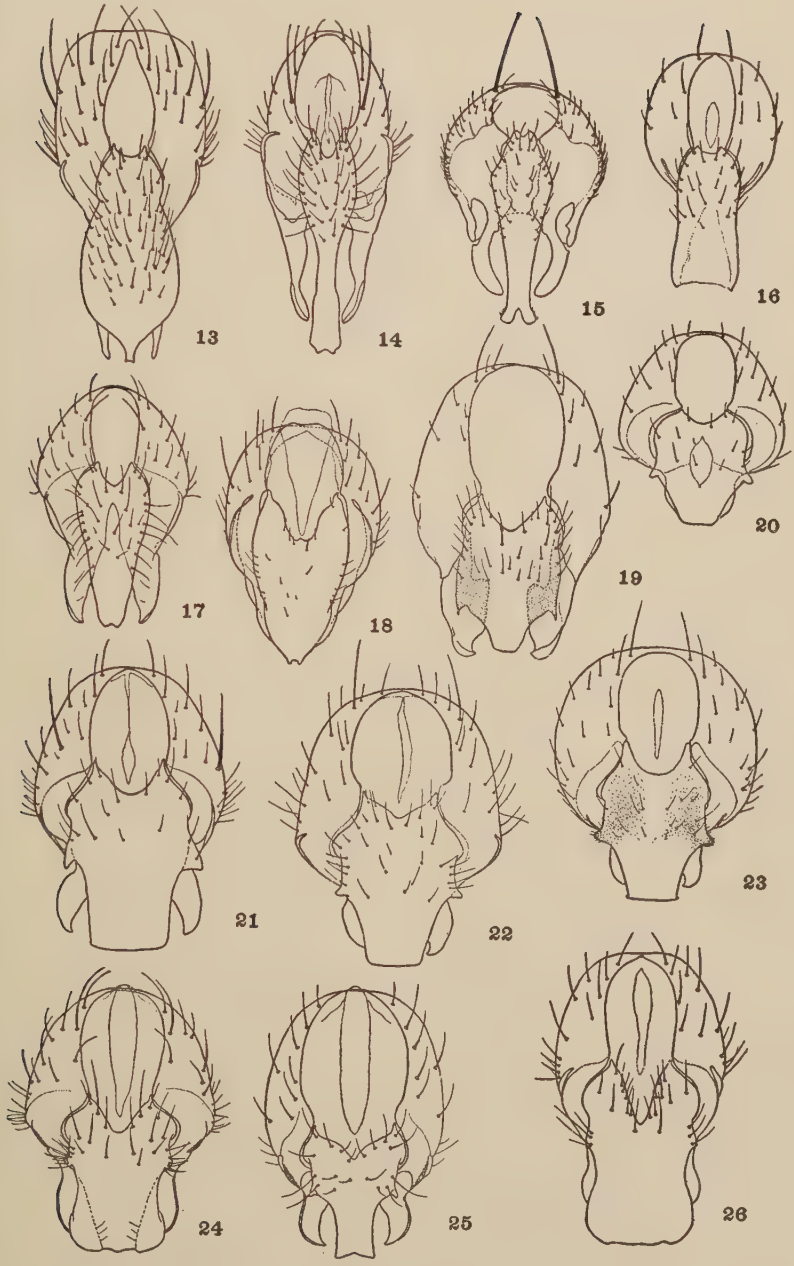
Ventral aspect of fifth abdominal sternum in male
Fig. 54.—*Coenosia* (*Limosia*) *fuscifrons* Malloch
Fig. 55.—*Coenosia* (*Limosia*) *pilosissima* Stein
Fig. 56.—*Coenosia* (*Limosia*) *oregonensis* Malloch
Fig. 57.—*Coenosia* (*Limosia*) *argenticeps* Malloch
Fig. 58.—*Coenosia* (*Limosia*) *setigera* Malloch
Fig. 59.—*Coenosia* (*Limosia*) *albibasis* Stein
Fig. 60.—*Coenosia* (*Limosia*) *anthracina* Malloch
Fig. 61.—*Coenosia* (*Limosia*) *atrata* Walker
Fig. 62.—*Coenosia* (*Limosia*) *fraterna* Malloch
Fig. 63.—*Coenosia* (*Limosia*) *aliena* Malloch

PLATE XIV

Ventral aspect of fifth abdominal sternum in male
Fig. 64.—*Coenosia* (*Limosia*) *errans* Malloch
Fig. 65.—*Coenosia* (*Limosia*) *lata* Walker
Fig. 66.—*Coenosia* (*Limosia*) *cilicauda* Malloch
Fig. 67.—*Coenosia* (*Limosia*) *compressa* Stein
Fig. 68.—*Coenosia* (*Limosia*) *compressa conforma* new variety
Fig. 69.—*Coenosia* (*Limosia*) *johnsoni* Malloch
Fig. 70.—*Coenosia* (*Limosia*) *triseta* Stein
Fig. 71.—*Coenosia* (*Limosia*) *bonita* new species
Fig. 72.—*Coenosia* (*Limosia*) *pedella* (Fallén)
Fig. 73.—*Coenosia* (*Limosia*) *frisoni* Malloch
Fig. 74.—*Coenosia* (*Limosia*) *perspicua* new species
Fig. 75.—*Coenosia* (*Limosia*) *incisurata* van der Wulp
Fig. 76.—*Coenosia* (*Limosia*) *furtiva* new species
Fig. 77.—*Coenosia* (*Limosia*) *tausa* new species
Fig. 78.—*Coenosia* (*Limosia*) *pallipes* Stein
Fig. 79.—*Coenosia* (*Limosia*) *nudiseta* Stein



HUCKETT—NORTH AMERICAN COENOSIA



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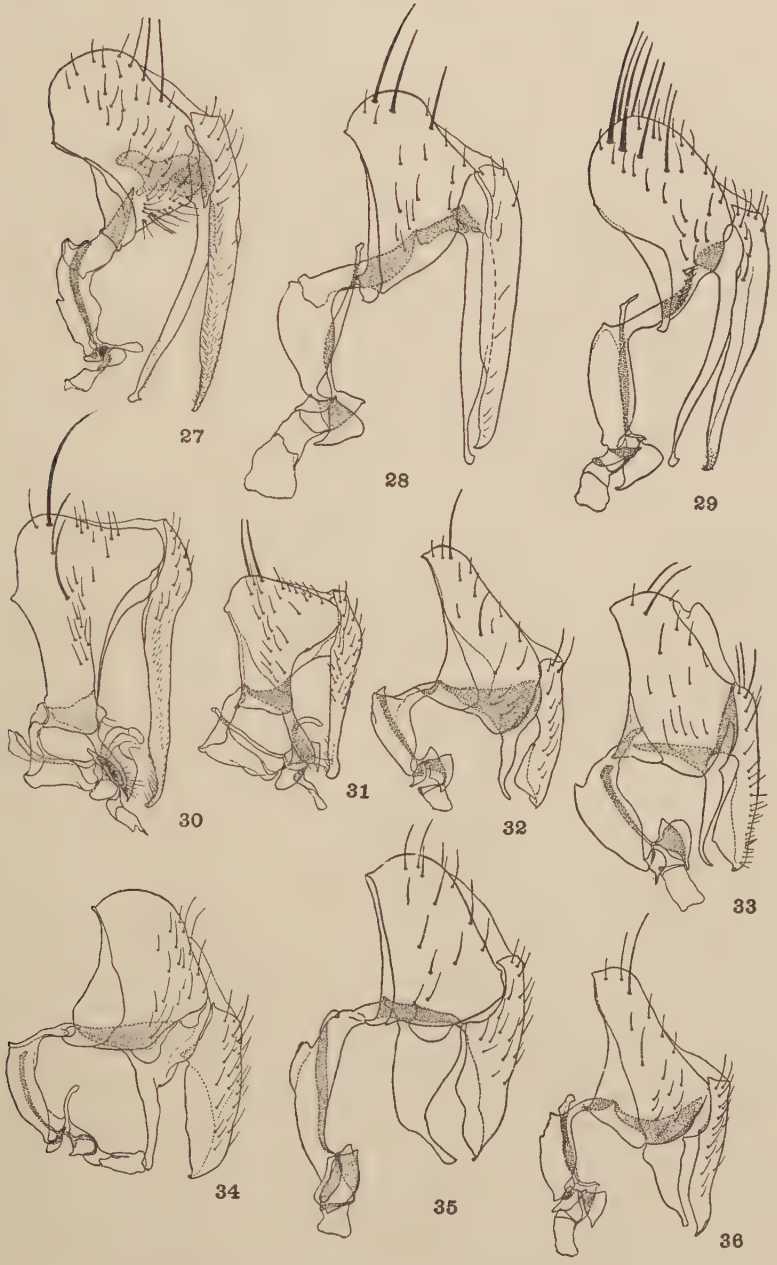

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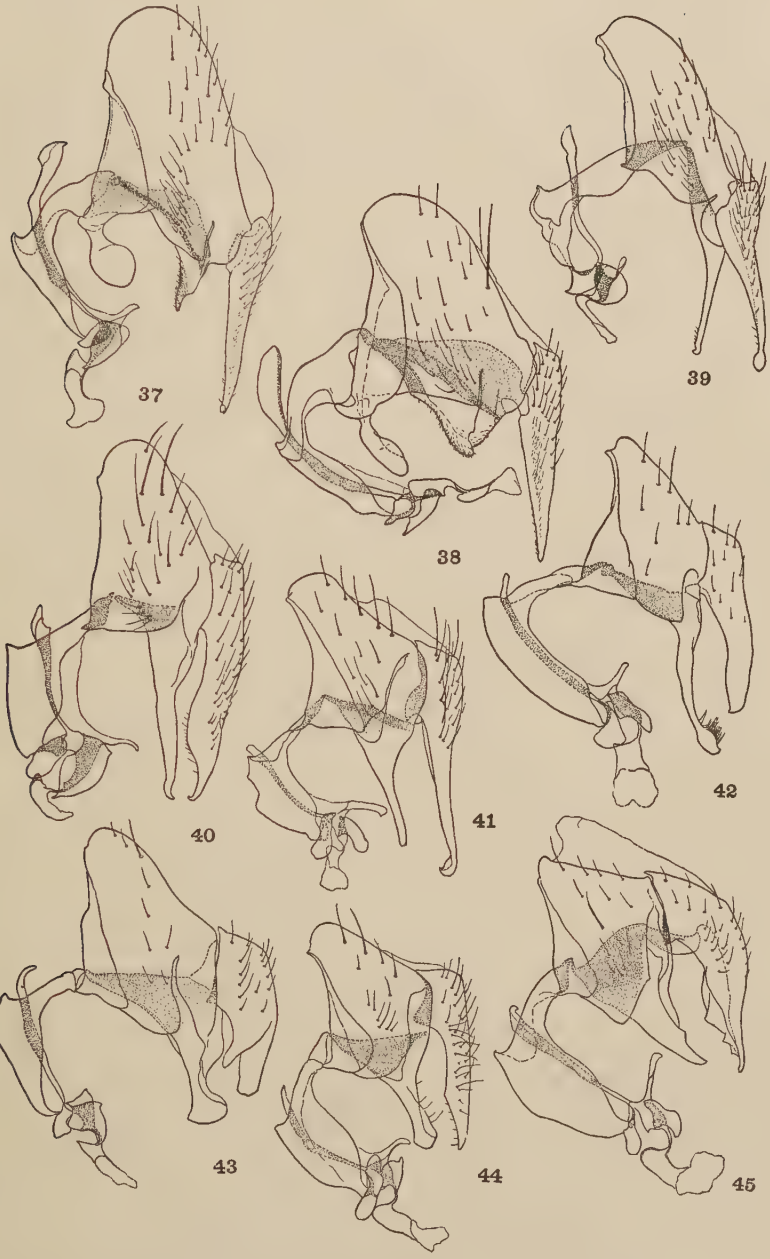

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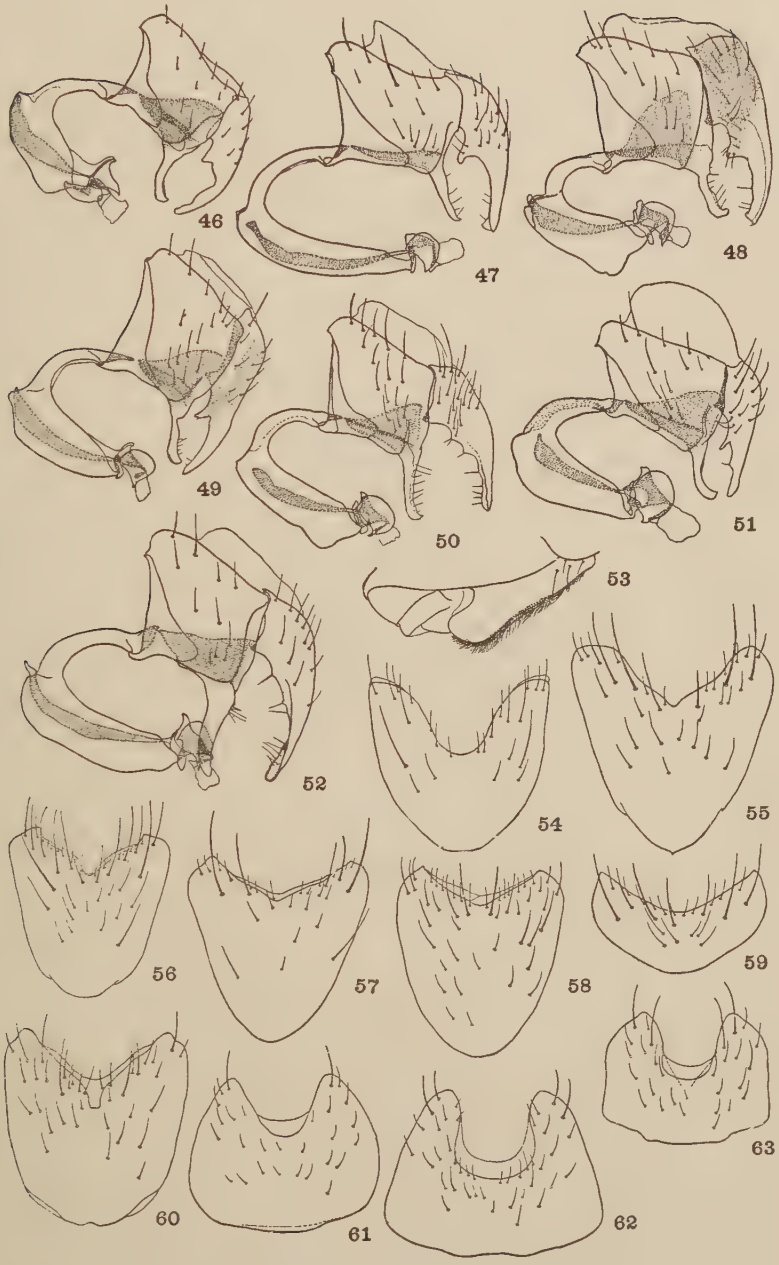

HUCKETT—NORTH AMERICAN COENOSIA

HUCKETT—NORTH AMERICAN COENOSIA

DESCRIPTIONS OF NEW GENERA AND SPECIES OF THE DIPTEROUS FAMILY EPHYDRIDAE. XI.[1]

BY EZRA T. CRESSON, JR.

(Plate XV)

Gymnopa paucula new species

Very similar to *G. subsultans*, but smaller, with very narrow cheeks; second and third antennal segments tawny and arista with a few (6) short hairs.

Halteres and tarsi pale yellow, the latter slightly infuscated distally. Wings hyaline with yellow veins. Entirely highly polished, without any vestiture except in the deep antennal foveae.

Head: height, length, width, as 53, 35, 74; frons .5 width of head, as long as broad, the areas defined only by their delimiting lines, but the mesofrons showing slight rugosity; a strong inner-vertical, a weaker parallel pair of preocellars, aligned with the anteocellus, a weak strongly divergent (laterally inclined) interocellar pair at vertical margin; a reclinate and two proclinate orbitals very weak; otherwise frons bare. Face .4 width of head, nearly as broad as long, with a weak median obtuse tubercle; facialia transversely rugose, with about five dorsomesally inclined bristles; parafacials obsolete above; epistomal margin strongly emarginate. Cheeks as broad as length of third antennal segment; postbucca marginate posteriorly; tormae well developed. Antennae slightly above center-line of eyes; second segment with long dorsal seta; third slightly longer than broad; arista long with five to six short hairs.

Mesonotum with numerous irregularly arranged setulae emanating from minute pits, the surface otherwise smooth. Two notopleurals, one post-alar, one dorsocentral towards posterior margin. Pleural surface and vestiture similar, but the setulae more sparse. Scutellum broader than long, slightly convex, semicircular, surface slightly rugulose, with short decussating apical bristles and several mesally inclined marginal setae.

Abdomen broader than long, convex; the setulae and their pits sparse; third to fourth tergites long, subequal in lengths, fifth narrowly visible.

Fore femora not spinose beneath, but distal half of flexor surface, slightly sulcate with a series of about five postflexor bristles.

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[1] Paper X. Ent. Nesw, XLII, pp. 168–170, (1931).

Wings with second and third costal sections as 74 : 29; second and third sections of fourth vein as 29 : 68; alula moderate with small aricula.

Length, 1.5 to 1.8 mm.

Type.—♂; Palmerston, North Australia. October, 1908. [Deut. Ent. Inst.].

Paratypes.—1 ♂, 1 ♀; topotypical.

Ditrichophora laevior new species

Apparently belonging with *triseta* Cresson and *albitarsis* Wulp, near *calceata*, in having the face strongly convex below and distinctly bifoveate above. It is entirely shining, at most sparingly brown pollinose, especially on the dorsum of the second to fourth abdominal segments.

Black; parafacials tawny, first segment of fore tarsi, first and second of middle and hind tarsi, orange. Halteres pale yellow. Wings with yellowish tinge; veins yellow. Shining to polished, very sparingly brown pollinose, becoming more dense on dorsum of second to fourth abdominal segments.

Head about as high as broad. Frons broader than long; the one proclinate frontorbital aligned with ocellars. Face slightly narrower than frons; the lower convex portion nearly twice as long as upper concaved protion, somewhat granulose; two strong bristles each side; parafacials very narrow, not dilated, polished. Cheeks as broad as length of third antennal segment; third segment discoidal; arista with five hairs.

Abdomen rather slender; fifth tergite of male longer than fourth, acute. Legs normal. Second costal section twice as long as third; second vein slightly curving into costa.

Length, 2.5 mm.

Type.—♂; Darjeeling, Behar, India. (Fruhstorfer). [A. N. S. P., no. 6509].

Paratype.—♀?; topotypical. [Vienna Nat. Hist. Mus.].

Ditrichophora triseta new species

This species is apparently very similar to *Clasiopa albitarsis* van der Wulp, but the frons are polished except the narrow anterior margin and at the vertex; the face except the foveae, gray pollinose. Meijere's[2] and Becker's[3] descriptions of *albitarsis* do not agree in this respect. The former described the face as "reiner schwarz unbestäubd." There is no suggestion of clouding

[2] Tijd. v. Ent., LVIII, p. 62, (1915).

[3] Ent. Mitt., XIII, p. 93, (1924).

on the posterior cross-vein, although the costal region seems slightly infuscated. The species belongs to the *calceata* group.

Black; halteres, middle and hind tarsi except apices, tawny. Wings brownish with dark veins. Frons polished with vertex, orbital prolongation and ocellar triangle, opaque, brownish; anterior margin narrowly niveous. Face sparingly dusted with gray; foveae shining. Lower occiput, postorbits, humeri and pleura, more or less gray. Mesonotum and scutellum subopaque, brown to yellowish pruinose. Abdomen subopaque black. Fore tarsi black or brown.

Frons quadrate, with anterior part noticeably convex in profile; proclinate frontorbitals aligned with ocellars. Face nearly as broad as vertex, nearly twice as long as broad, prominent medially; carina and foveae weak; lower convex portion, in profile twice as long as upper; two stout upper and one weak lower bristle each side; parafacial bare, linear above, dilating below. Cheek as broad as lengths of second and third antennal segments together; arista with five to six hairs.

Scutellum flat, acutely rounded apically. Abdomen elongate. Fore femora with postflexor comb of short spinules. Third costal section twice as long as second; second vein straight.

Length, 2.4–3 mm.

Type.—♂; Materan, Konkan, India, 800 ft. alt. (Biro; 1909). [A. N. S. P., no. 6510].

Paratypes.—2 ♂, 7 ♀; topotypical.

PLAGIOPSIS new name

1918. *Plagiops* Cresson, Trans. Am. Ent. Soc., XLI, p. 53. (Not of Townsend, 1911.)

Dr. Townsend's use of this name in the Tachinidae[4] makes necessary this change.

BECKERIELLA Williston

1897. *Beckeriella* Williston, Kans. Univ. Quart., VI, p. 2.

The structural similarity between the species of this genus and those of *Gastrops* is very marked, in fact, were it not for the flat to concaved or slightly convex face of *Beckeriella* as opposed to the characteristically strongly convex to gibbose face of *Gastrops*, the two groups of species could almost be considered congeneric. The general structure of the head, thorax and abdomen is so similar in the two genera that their close relationship is evident.

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[4] Ins. Ins. Mens., IV, p. 57, (1911).

As far as known, the species are neotropical in distribution. The following four are all the species known at present. A key to these is given at the end of this generic treatise.

Genotype: *Ephydra bispinosa* Thomson.

Beckeriella bispinosa (Thomson) (Pl. XV, figs. 1–3)

1868. *Ephydra bispinosa* Thomson, Eugenies Resa, Zool., I, p. 593.
1897. *Beckeriella bispinosa* Williston, Kans. Univ. Quart., VI, p. 2.

The following description is based on a female, apparently the specimen mentioned by Williston (1897) collected by Dr. H. H. Smith at Rio de Janeiro, the type locality of Thomson's species. This specimen was given to me by Dr. Williston and is now in the collection of the Academy of Natural Sciences of Philadelphia.

Anterior angles of the frons, antennae, palpi, proboscis, all tibiae, pedicel of halteres, and tarsi except apices, tawny to yellow. Wings brownish with maculation as figured (Fig. 2) consisting of infuscated areas between the veins and denser clouds around the crossveins and tips of the second, third and fourth. No infuscated spots on the third vein. Veins dark.

Shining, sparingly white and brown pollinose. Head and thorax smooth. Frons rather densely light brown pollinose. Face white, parafacials densely so, leaving the parafacial ridges bare. The polliniferous design on the mesonotum suggests two to three longitudinal brown stripes. Scutellum similar to mesonotum. Abdomen sparingly white pollinose except posterior margins of second to fourth tergites; third and fourth tergites with a subapical median transverse spot of dense white and brown pollen. Legs shining, almost destitute of pollen.

Head in profile as figured (Fig. 1). Face longer than broad, with slight median convexity above, limited below by a transverse shallow sulcus, below which the convex epistoma strongly protrudes. Antennae damaged, but the second and basal portions of third bearing the eight haired arista are intact.

Scutellum quadrate, subbilobate, convex, the apex subemarginate, the lateral angles prolonged into two long slender tubercles, each tipped with a minute spine (Fig. 3).

Abdomen rotund, very convex, almost hemispherical with lateral margins not turned under; surface strongly scabrous and with appressed setulae except the narrow posterior margins of the tergites.

Venation normal (Fig. 2); veins slightly undulating.

Length, 3 mm.

Type.—♂; Rio de Janeiro, Brazil. [Royal Swedish Academy Collection ?].

Beckeriella schildi new species (Pl. XV, figs. 4–6)

Closely allied to *bispinosa*, but the thorax and scutellum are shining without any or with very sparse vestiture. The scutellum has four stout, somewhat pear-shaped tubercles. The wings are very dark with sharply defined, rounded clear spots between the strongly undulating veins.

Antennae, pedicel of halteres, tibiae and tarsi except apices, tawny to yellow. Wings strongly infuscated with large, sharply defined hyaline spots between the veins as figured (Fig. 5). No infuscated spots on the third vein.

Shining to polished; frons cinereous with a strongly undulating, transverse shining line originating at the lateral vertical angles, attaining anterior margin at base of each antenna. Face more or less yellowish pollinose, densely so above in the foveae and on the parafacials, leaving the parafacial ridges shining. Cheeks and occiput rather densely pollinose. Thorax and scutellum with very sparse vestiture. Abdomen more or less grayish, but not obscuring the shining and scabrous surface; a densely brown pollinose subapical spot on fourth tergite. Femora very sparingly pollinose.

Head in profile as figured (Fig. 4); frons much broader than long, areas not sharply defined. Face as in *bispinosa;* antennae porrect with third segment about twice as long as second; arista with eleven hairs. Scutellum bilobate, broader than long, with four very characteristic tubercles as figured (Fig. 6), the apical pair bearing small spines at their tips.

Abdomen and legs as in *bispinosa.*

Venation (Fig. 5) similar to that of *bispinosa* but the veins are strongly undulated, especially the second.

Length, 3 mm.

Type.— ♀ ; Higuito, San Mateo, Costa Rica. (Pablo Schild). [U. S. N. M., no. 50530].

Beckeriella magnicornis new species (Pl. XV, figs. 7–9)

This and the following species form a group differing from the foregoing in that the mesonotum and scutellum are granulosely sculptured; the latter lacking the long tubercles so characteristic of those species. There is also a marked development of the first antennal segment which gives the third a pendant position; and in addition we have a noticeable maculation along the third vein of the wings. The present species has the wings hyaline with isolated infuscated spots and a normally developed second vein.

Second and third antennal segments, pedicel of halteres, entire fore tibiae, apices of middle and hind tibiae and all tarsi except apices, tawny to yellow. Wings yellowish with large clouds at tips of first and second veins, at crossveins and a series of small dots on the third. (Fig. 8.)

Opaque; cinereous, variegated with brown. Face with the narrow epistomal margin and two short dashes mesad of facialia below, polished black. Cheeks and occiput cinereous. Mesonotum cinereous with brown dots at bases of setulae and several rather large more or less rounded, brown spots as follows: two anteriorly between the dorsocentral and acrostichal lines, one at suture in acrostichal line, two mesad of bristles at posterior margin. Scutellum concolorous with mesonotum, with brown spots at apical angles. Abdomen cinereous, but leaving the posterior margins of tergites and a dot at each setula and three irregular spots near posterior margin of fourth, polished. Femora sparingly brown pollinose.

Head profile as figured (Fig. 7). Frons much broader than long; orbits parallel; bristles well developed, but one frontorbital present, which is strong and proclinate. Face almost as broad as vertex, as broad as long; in profile as figured; medifacies broadly convex, limited laterally by distinct foveal sulci which fall parallel almost to epistomal margin; a small distinct conical tubercle between antennae; facialia bearing one to two distinct bristles on lower half; parafacial linear. Cheeks about .6 height of eye in width, with distinct bristle; postbucca not differentiated from occiput and bears several long hairs. Oral opening small, circular. Antennae as figured (Fig. 7).

Mesonotum and scutellum granulosely sculptured, the former with well developed setulae in the dorsocentral and acrostichal series. Scutellum very large, quadrate as figured (Fig. 9), about one-half as long as mesonotum, convex and setulose, with strong widely separated apical bristles from minute basal papillose tubercles.

Abdomen round, hemispherical, entire surface except the narrow posterior margins of second to fifth tergites, sculptured as in *Gastrops;* third and fourth tergites long, subequal in lengths; fifth very short.

Legs simple, with scattered long pile and a few flexor bristles on middle femora. Venation as figured (Fig. 8).

Length, 2.7 mm.

Type.—♂; Alhajuela, Canal Zone, Panama. May 27, 1917. (A. Busck). [U. S. N. M., no. 21853].

Paratypes.—1 ♀; topotypical. 1 ♂; Higuito, San Mateo, Costa Rica, (Pablo Schild), [U. S. N. M.].

Beckeriella pendicornis new species (Pl. XV, figs. 10–11)

Very similar to *magnicornis* in general appearance, but with an entirely different wing maculation and venation.

Mouth parts, base of third antennal segment, base of arista, face, cheeks, pedicel of halteres, basal segments of tarsi, tawny to yellow. Wings somewhat infuscated with numerous irregular diluted spots between the veins and along the strongly clouded third vein, as figured (Fig. 11).

Opaque above with gray and brown pattern of the vestiture similar to that of *magnicornis*. Abdomen with a rather relieved spiracle shaped, densely pubescent yellowish spot near lateral apical margin of fourth tergite; apical margins of tergites not bare and shining. Legs somewhat obscured.

Head in profile as figured (Fig. 10). Frons broader than long, subconically produced at antennae. Face nearly twice as long as broad, concaved in profile as figured. Cheeks in width less than one-half height of eye. Antennae with first segment distinctly visible; third, pendant, nearly four times as long as broad; arista with about ten hairs.

Mesonotal setulae minute. Scutellum as in *magnicornis*, quadrate or slightly longer than broad, flattened; apical bristles stout, widely separated on minute tubercles; lateral bristle very weak.

Abdomen as in *magnicornis* except as described above.

Venation as figured, with the undulating second vein strongly bent towards costa; fifth vein strongly bowed towards inferior margin; third and fourth, comparatively straight.

Length, 2.5 mm.

Type.—♂; Costa Rica. (Pablo Schild). [U. S. N. M., no. 25313].

Paratypes.—1 ♂; topotypical. 13 ♂, 7 ♀; Higuito, San Mateo, (Pablo Schild), [U. S. N. M.]. 1 ♂; Grenada, Nicaragua, (Baker), [U. S. N. M.].

Key to the Known Species of Beckeriella

Scutellum turgid, subbilobate, smooth.

Scutellum with two long apical tubercles *bispinosa* Thomson

Scutellum with four stout tubercles..... *schildi* Cresson

Scutellum quadrate, flattened, rough.

Second vein strongly curving and parallelling costa before entering costa..... *pendicornis* Cresson

Second vein normal, straight until abruptly curving into costa..... *magnicornis* Cresson

Lytogaster angustata new species

Very similar to *pallipes* Cress. but distinguished by the dark femora.

Black; antennae except third segment above, palpi, halteres, tibiae except medially, and tarsi except apical segments, pale; femora except extremities, dark. Wings hyaline with pale veins.

Shining to polished; sparingly cinereous above, more densely so below. Frons, pleura, mesonotum and scutellum distinctly but minutely punctulate, but not obscuring the shining surfaces. Face micropunctulate, more or less obscured by whitish pollen, but leaving the parafacial groove bare and black in contrast, flat with carina scarcely discernible. Abdomen polished with sculpturing very obscure in the depressions of the second and third segments. Length 2 mm.

Type.— ♀ ? Pinar del Rio, Pinar del Rio, Cuba, Sept. 9, 1913, (3345). [Am. Mus. Nat. Hist.].

Paratype.—1 specimen; topotypical.

Hyadina sauteri new species

A species very similar to *H. fenestrata* Becker, described from Egypt and reported from the Canary Islands. I had previously[5] considered this form conspecific with *fenestrata*, but more critical study of additional material disclosed some differences which seem to hold and to be of specific value. The series of the present species before me differ from my specimens of *fenestrata* from the Canary Islands in having the third antennal segment distinctly longer than broad; cheeks not broader than width of third antennal segment; the wings are also narrower.

Black; third antennal segment below, palpi, legs including coxae and wing-veins tawny. Halteres white. Wings hyaline with two small round lactaceous spots, one each side of posterior cross-vein.

Head width, height and length, as 14 : 10 : 8, the horizontal length at antennae about equal to that at line of buccal orbit. Frons .6 width of head, about twice as long as broad, largely polished; orbits slightly converging anteriorly. Face .3 width of head, .6 broad as long, in profile with slight median hump, whitish pollinose with poorly defined median stripe. Cheeks at most as broad as third antennal segment. Antennae situated well above center line of eyes; third segment distinctly longer than broad, broadly rounded apically.

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[5] Trans. Am. Ent. Soc., LVI, p. 103, (1930).

Mesonotum smooth in male, to micro-granulose or rugulose in female, sparingly brown pollinose, sometimes with two median cinereous dashes anteriorly. Pleura more or less cinereous. Scutellum velvety-black laterally. Abdomen opaque basally, polished apically. Wings 2.5 long as broad.

Female more robust than the male with face and cheeks broader. Length, 1.2 to 1.6 mm.

Type.—♂; Tainan, Formosa. (H. Sauter; May, 1912). [Deut. Ent. Inst. Colln.].

Paratypes.—2 ♂, 1 ♀; topotypical with same date. 5 ♂, 1 ♀; topotypical, February, 1909. [Hung. Nat. Mus. and Deut. Ent. Inst.]

Two females from Manila, Philippine Islands, (Brown), [U. S. Nat. Mus.] seem to be conspecific.

Hyadina typically has the head transverse, eyes round, prominent; ocelli on a distinct tumor; face in profile more or less convex with facialia broad; mouth small; abdomen rather flat, not abnormally convex or arched in profile; costa attaining fourth vein, with second vein short, the second section of costa seldom longer than third. The third antennal segment in the known species has the lower portion noticeably paler than the upper.

Key to the Described Indo-Australian Species

Wings hyaline with dark vittae between the veins (New Zealand).[6]
obscuripes Tonnoir & Malloch
irrorata Tonnoir & Malloch

Wings without infuscation between the veins.
Scutellum velvety-black laterally..... *sauteri* Cresson
Scutellum not so..... *pullipes* Cresson[7]

Pelina compar new species

A species very similar to the European *P. aenescens* Stenhammar, but that one has the mesopleura smooth and polished. The present species is more slender than *truncatula*, especially the abdomen, and the mesonotum more smooth and shining.

Halteres pale ochreous; tarsi brown with basal segments slightly paler. Wings with dark veins. Very sparingly brown

[6] I question the membership of these species in this genus. They were described in the Rec. Canterb. Mus., III, p. 16, (1926).

[7] Described from Australia. Trans. Am. Ent. Soc., LVI, p. 103, (1930).

pollinose above, more or less cinereous below; face and cheeks densely sericeous white. Frons and mesonotum rather smooth and shining, aeneous; scutellum also shining, but transversely wrinkled; dorsum of second to fourth abdominal segments granulose with suggestion of transverse wrinkles and longitudinal wavy rugae, lateral margins and fifth segment smooth and shining.

Head height, width and length as 10, 19 and 7; cephalic aspect transverse elliptical, with dorsal and ventral lines slightly convex. Eyes large. Frons almost quadrate, in profile slightly convex; frontalia black; two to three proclinate frontorbital setulae, and distinct laterally inclined frontal bristle, present. Face broad as long, in profile straight, with about four hair-like bristles, of which the upper one, aligned with buccal orbit, is much longer than the others. Cheeks in width about twice breadth of third antennal segment, with small bristle. Postbucca slightly turgid. Mouth .3 width of head.

Mesonotum with distinct dorsocentral and approximate acrostichal series of setulae and the usual extra-dorsocentral bristle posteriorly. Mesopleura weakly granulose, posteriorly shining. Scutellum triangular, about as long as broad; apex rounded with at most a suggestion of a median tubercle; the lateral seta nearer apex than base.

Abdomen narrower than thorax, elongate, the second to fourth tergites long, subequal in lengths, about one-half as long as broad; fifth shorter, triangular.

Venation and legs normal.

Length, 2.5 mm.

Type.—♂; Tacoma, Washington. August 27, 1911. (A. L. Melander). [Melander Colln.].

Paratype.—1 ♂; topotypical.

Pelina canadensis new species

This species may easily be confused with *truncatula* Lw. but is at once distinguished by the punctate, not rugulose sculpturing of the abdominal dorsum. In addition there are the following differentiating characters:

Middle and hind tarsi basally noticeably tawny. Cheeks proportionally narrower and the mouth wider, resulting in a less triangular, but more elliptical shape of the head in frontal aspect. Mesonotum less granulose, almost smooth except the intradorsocentral stripes.

Dorsum of abdominal tergites two to three with punctules or scars at the bases of the appressed hairs, which scars are more or less connected by oblique and transverse sulci (as contrasted with the wavy longitudinal rugae in *truncatula*). These sulci are much

less noticeable on the fourth tergite although the scars are present. Laterally and on fifth tergite the scars are absent, resulting in a smooth surface.

Length, 3 to 3.5 mm.

Type.—♂; Aweme, Manitoba, Canada. October 12, 1915. (N. Criddle). [U. S. N. M., no. 50528].

Paratypes.—2 ♀; Cranbrook, British Columbia, Canada. May 12, 1922, (C. B. D. Garrett), [Canada Nat. Coll.]. 1 ♀; Norman County, Minnesota, June 4, 1923, (A. A. Nichol), [Univ. Minn. Colln.].

We have three known species of the genus *Pelina* in North America, which may be separated as follows:

Mesonotum rather smooth, not granulose . . . . . *compar* Cresson
Mesonotum densely and distinctly granulose.
  Sculpturing of the abdomen in form of wavy or zig-zag linear rugae . . . . . *truncatula* Loew
  Sculpturing of abdomen in form of pits or scars, obliquely and transversely connected by fine sulci.
    canadensis Cresson

Pelina pentheri new species

Differing from any known species of the genus in the distinct conical, apical, unarmed tubercle on the scutellum similar to those found in many species of *Napaea*. The convex face suggests *Lytogaster*.

Palpi brownish; halteres pale ochreous; bases of middle and hind tarsi except apices, tawny; fore tarsi darker. Wings hyaline, immaculate with pale veins. Shining, aeneous, with two bluish intra-dorsocentral stripes. Sparingly brown pollinose above, becoming cinereous laterally and ventrally; face, cheeks and postbucca, densely cinereous.

Head, height, width and length as 10, 16 and 8; cephalic aspect slightly triangular. Frons, one-half wide as head. Surface slightly relieved; frontal bristle small, hair-like; frontorbitals microscopic. Face, .4 width of head; in profile slightly convex with epistomal margin slightly retreating; about four hair-like side bristles present. Cheeks in width, twice that of third antennal segment. Postbucca moderately turgid, not strongly so posteriorly; bristle hair-like.

Mesopleura entirely pollinose with surface slightly granulose. Scutellum triangular, as long as broad with surface slightly

wrinkled; the narrow apex with a distinct, unarmed, conical tubercle between the apical bristles.

Abdomen ovate with lateral margins sharp; dorsum of second tergite with minute rugae, radiating from base; third, shining with minute transverse rugae; fourth and fifth shining, smooth. Of the male the third tergite is longer than second, fourth longer than third, fifth short, triangular; of female second to fourth subequal in length.

Femora and tibiae aeneous. Venation normal.

Length, 3 to 3.5 mm.

Type.—♂; Boz-Oynk, Kara-Koi, Brussa, Asia Minor. (Dr. Penther). [A. N. S. P., no. 6503].

Paratype.—1 ♀; topotypical.

Pelinoides uncta new species

Differs from *P. sulcata* Cresson[8] in being entirely opaque, brown marked with cinereous.

Black; cheeks, extreme base of third antennal segment, palpi, halteres, apices of coxae, femora, bases and apices of tibiae, two basal segments of tarsi, ferruginous to tawny. Entirely opaque, mars brown with cinereous markings; face and cheeks niveous.

Head slightly broader than high. Eyes almost round, slightly oblique. Frons broader than long; orbits slightly converging, narrowly cinereous anteriorly; mesofrons occupying almost entire frons with ocellar tumor very prominent; the frontalia and parafrons linear; a small, stout inner-vertical bristle, two to three proclinate orbital hairs and a pair of small hair-like ocellars, present. Lunule small, cinereous, with a sharp brown transverse carina above antennae. Face one-third width of head, slightly longer than broad, strongly and sharply carinate medianly, entirely densely niveous, in certain aspects showing the pale ground color in foveae. Cheeks one-half height of head, concolorous with face. Occiput brown, above with two median cinereous stripes from vertex. Antennae with third segment distinctly longer than broad; apex more or less angular above.

Mesonotum with two cinereous intra-dorsocentral stripes, dilated anteriorly, not attaining posterior margin, also with ante- and postsutural intra-alar spots; upper surface of humeri, notopleural and supra-alar spots also cinereous; humeri not strongly carinate nor with noticeable horizontal upper surface. Pleura with two brown spots at upper margin of mesopleura and one at lower posterior angle, also others at upper and lower part of pteropleura. Scutellum with conspicuous cinereous median stripe continuous over onto inferior surface at apex.

[8] Dipt. Pat. & South Chile, VI, p. 102, (1931).

Abdomen with apices of second to fifth tergites narrowly cinereous, more or less broadly interrupted medianly on second to fourth; genital segment with sharp anal carina.

Femora cinereous, with posterior surface of middle and hind ones polished; tibiae more or less cinereous with extensor surfaces polished which condition does not attain apices nor bases of fore and middle ones. Wings normal, as in *sulcata*.

Length, 2.7 mm.

Type.—♂; Montevideo, Uruguay. October 17, 1926. (F. & M. Edwards). [British Mus. Nat. Hist.].

Paratype.—1 ♂; topotypical.

PHYSEMOPS new genus

GENOTYPE: *Psilephydra nemorosa* Cresson, 1918.

After examining a paratype of *Psilephydra cyanocephala* Hendel, from Formosa, the genotype of *Psilephydra*, the status of *P. nemorosa* Cresson, from Costa Rica, must be changed. It cannot consistently be considered congeneric with the Formosan species. The Costa Rican species has the following characters at variance with *cyanocephala:*

No ocellar bristles; eyes pilose; no parafacials, the medifacies with well separated declinate hairs over the entire surface, with no suggestion of a median intrafoveal hump; antennae very small with a long microplumose arista; postbuccal area small, not noticeably turgid. Thorax transverse, with one dorsocentral; scutellum semicircular in outline. Ventral lobes of abdomen nearly contiguous.

The long hair-like arista is unusual for this family and therefore affords a distinguishing character, which with the convex face devoid of any indication of the parafacials, should at once characterize this genus. It seems to be an Ephydrid, but is not typical, especially in the above mentioned characters. In general habitus otherwise it seems to be located with *Psilephydra* and associated with the genera allied to *Parydra*.

NAPAEA Robineau-Desvoidy

1830. *Napaea* Robineau-Desvoidy, Essai Myod., p. 799.

Hendel contends[9] that Robineau-Desvoidy's name is preoccupied by Hübner in his Sammlung exotischer Schmetterlinge,

[9] Verh. Z.-B., Gesel. Wien, LXXXI, p. 15, (1933).

Bd. 1, Plate (34) "Papiliones, Nymphales, Napaea Frequentes," illustrating *Papilio actoris* Cramer. As Hübner is neither binary nor binominal in this volume, it will not satisfy Article 25 of the International Rules of Zoölogical Nomenclature, and therefore is not citable for valid generic names.

Napaea hulli new species

Closely allied to *abbreviata* Loew, differing conspicuously in the entirely yellow legs and in the narrower frons.

Palpi, base of third antennal segment, halteres, legs including trochanters and femora, tawny to ochreous; apices of tarsi slightly discolored.

Vestiture similar to that of *abbreviata* except the legs are sparsely ochreous, not cinereous.

Frons about one-half as wide as head; orbits more converging anteriorly to a narrower and longer face than in *abbreviata*. Eyes more oblique; foveal depression not appreciable.

Type.—♂; Agricultural College, Mississippi. August 18, 1922. (F. M. Hull). [A. N. S. P., no. 6511].

Napaea undulata new species

The convex hump-like facial profile and the tuberculate scutellum, places this species in the group with *imitans*, *unituberculata* and *aurata*. It differs from any of these by its smaller size and short second vein.

The more or less greasy condition of the type specimen obliterates some of the vestitural color especially that of the face, but there are sufficient structural characters to establish its specific distinction.

Halteres and apparently the second and base of third antennal segments, tibiae and bases of tarsi, yellowish. Wings infuscated and somewhat mottled with intervenous clouds, with the usual clouds over the cross-veins and at tip of second vein; with seven whitish spots about the cross-veins.

The somewhat shining upper surfaces dark to golden brown pollinous varied with grayish. Mesonotum with some dashes and spots of gray. Scutellum with gray spots proximad of the apical bristles and on the apical tubercle. Abdomen grayish pollinose with denuded dots at bases of the setae and hairs.

Frons about one-half width of head with well developed bristles. Face slightly narrower than frons; in profile, convex with slight hump, falling thence vertically to epistoma; foveal depression weak. Cheeks about one-fourth height of head.

Mesonotum with sutural dorsocentrals scarcely differentiated. Scutellum very convex, with a distinct unarmed apical conical tubercle between the well developed apical bristles. Abdomen rotund, with lateral margins sharp.

Wings broad and short, with strong undulating veins; second vein very short, making the second costal section much shorter than the third, abruptly entering the costa with a long subterminal appendage; third vein strongly diverging from fourth distally; second section of fourth vein longer than third; fifth vein strongly curved near base, resulting in the discal cell becoming much broader there than at the posterior cross-vein.

Length, 2.5 mm.

Type.—♀; Rock Creek, District of Columbia. August 3, 1913. (R. C. Shannon). [U. S. N. M., no. 50529].

Napaea socia new species

Very similar to the European *Ephydra coarctata* Fallen, differing most noticeably in the less densely polliniferous vestiture, resulting in a more shining appearance; in this respect simulating *Ephydra littoralis* Meigen, but with the lateral margins of the male abdomen revolute. The present species differs noticeably from its nearest American ally, *appendiculata* Loew, in its smaller size and in the pale, whitish color of the bristles of the legs.

Black; bases of tarsi paler. Halteres yellowish. Wings hyaline with slight brownish tinge; cross-veins and tip of second to fourth veins distinctly clouded; the whitish spots very faint.

Shining, sparingly yellowish brown pollinose, becoming grayish beneath; frontalia opaque brown. Intra-dorsocentral stripes visible at anterior margin of mesonotum; a whitish spot at each dorsal sutural angle. Abdomen, femora and tibiae tinged with bluish or bronze.

Structurally similar to *appendiculata*, but slightly larger. Face in profile slightly concaved above and median tuberosity rather more distinct. Cheeks broader than width of third antennal segment. Scutellum more pointed. Legs, including coxae, almost destitute of bristles, those present are weak, white or yellowish. Wings more elongate than in *appendiculata*. Abdomen with lateral margins revolute but the lobes not completely turned under.

Female similar but the abdomen with lateral margins sharply turned under.

Length, 2.7 to 3.3 mm.

Type.—♂; Berkeley Hills, Alameda County, California. April 11, 1908. (Cresson). [A. N. S. P., no. 6504].

Paratypes.—7 ♂, 3 ♀; topotypical.

PARYDRA Stenhammar

1844. *Parydra* Stenhammar, Kongl. Vet. Akad. Handl., 1843, p. 144.
1931. *Parhydra* Hendel, Verh. Zool.-Bot. Gesell. Wien, LXXXI, p. 16.

Although Hendel's emendation is the correct transliteration of the Greek, Stenhammar's name was the one proposed for this genus and should stand. There is no necessity for changing this long established name.

Parydra humilis Williston

1897. *Parydra humilis* Williston, Kans. Univ. Quart., VI, p. 7.
1931. *Parydra humeralis* Cresson, Dipt. Pat. & So. Chile, VI, p. 104.

This species was cited as *humeralis* in error. Proof of my paper was not submitted to me before printing.

Ephydra mexicana new species

Similar to *E. pectinulata* Cresson in general features; the greater differences being found in the general brownish rather than cinereous thoracic vestiture. The mesopleural cilia is weak, and the abdomen is subopaque with distinct metallic tinge, not the glaucous-gray opacity of *pectinulata.*

Palpi, extreme bases of tibiae, and tarsi except apices, tawny. Wings yellowish with pale veins.

Frons and intra-antennal area shining, metallic blue, sparingly pollinose. Mesonotum somewhat shining laterally and posteriorly, metallic bronze and coppery. Scutellum similarly colored. Abdomen subopaque, metallic green and bronze. Otherwise opaque to subopaque, brown to ochreous above and on sides except the abdomen. Face whitish to niveous; cheeks cinereous to olivaceous; femora cinereous with slight ochreous tinge.

Head slightly longer than high (as 94 and 82), 1.5 as broad as high. Frons almost horizontal in profile, with the posterior frontal seta almost as strong as the frontorbitals. Face about .5 width of head (as 68 and 130), with rather stout bristles in the facial series, which latter extends obliquely ventrolaterally to below line of buccal orbits; cilia of oral margin rather sparse in both sexes. Cheeks about .3 height of head (as 24 and 82); the postorbital cilia with several long bristles in lower portion which are as long as those in the oral cilia.

Mesonotal acrostichal setulae in two distinct series, with no appreciable posterior callus but that region somewhat pilose. Scutellum noticeably elongate and transversely rugulose and apically pilose in the female; mesopleural cilia rather sparse.

Abdomen ovate, setulae and marginal bristles rather pronounced; fifth tergite of male not longer than fourth.

The male genitalia does not differ materially from that of *pectinulata*.

Posterior cross-vein at about 90 degrees with fifth vein.

Length, 5.3 mm.

Type.—♂; Mexico. [A. N. S. P., no. 6505].

Paratypes.—2 ♀; Mexico, [Vienna Nat. Hist. Mus.]. 1 ♂, 2 ♀; Mexico, (Billimek, 1883), [Vienna]. 1 ♀; Mexico, "Stadt," (Billimek, 1871), [Vienna].

Ephydra thermophila new species

Very similar to *E. niveiceps* Cresson, described from Washington, but apparently distinct. The tarsi are black; the face cinereous to white, but not sericeous, heavily setose; abdomen subopaque.

Palpi and tarsi black; extreme bases of tibiae, halteres, squamae and wing veins, pale. Entirely cinereous except the shining, metallic cupreous mesofrons and interantennal area; mesonotum and scutellum faintly metallic; abdomen uniformly subopaque, with scarcely perceptible metallic tint. Face white below.

Facial bristles strong, ventrolaterally inclined, the series strongly curving ventrolaterally, extending well towards oral margin. Cheeks about .4 height of head, without any stronger bristles in the lower postorbital series.

Acrostichals rather weak in two indistinct series, no densely setose area posteriorly. Scutellum as broad as long, sparsely setose. Abdomen with marginal and discal bristles and setulae short. The male genitalia shows very little difference from that of *niveiceps*.

Length, 4.2 mm.

Type.—♂; Yellowstone Park Lake, Wyoming. July 18, 1923. (A. L. Melander; in hot water). [A. N. S. P., no. 6506].

Paratypes.—2 ♂; topotypical with same data.

A pair from Norris Basin, Yellowstone Park, July 26, 1923 (A. L. Melander), are more strongly bristly especially on the face, and the wing veins are blackish.

Ephydra bruesi new species

1924. *Ephydra pectinulata* Brues, Proc. Am. Acad. Arts & Sci., LIX, p. 403, fig. 5. (Description and figures of larva and puparium.)

The adult mentioned by Dr. Brues in the above reference was identified by me as *pectinulata* Cresson, however with some degree of doubt as it did not perfectly agree with my original series of

that species. Subsequent acquisition of typical *pectinulata* material has given me a better conception of that species and the apparent stability of its characteristics leads me to consider Dr. Brues' specimen to represent a distinct species. It is not only distinct from, but belongs to a different group than, *pectinulata* and is allied to *niveiceps* Cresson, and very similar to *thermophila* above described; differing from that species in its general brownish color, with the face deeply ochreous and with the posterior margin of the mesopleura densely bristly.

Palpi and tarsi black.

Head about 1.4 as long as high (height, length, width as 88, 118, 133). Eyes almost round. Cheeks .3 height of head. Frons nearly quadrate, with quadrate mesofrons; frontal orbits opaque brown becoming grayish anteriorly. Face and cheeks dark ochre; the medifacial setulae relatively strong and the lateral series of bristles relatively weak, the series strongly curving ventro-laterally to near oral margin.

Thorax olive brown with the notopleural and supraalar regions more grayish; mesonotum subopaque with faint metallic cupreous tinge, overcast with brown; no vittae except faintly in certain aspects, contrasted by the more opaque pollinose intra-dorsocentral lines; acrostichal setulae in two series but are not much stronger than the surrounding hairs. Prescutellar callus developed and setulose; the prescutellar acrostichal pair nearly as strong as the dorsocentrals. Scutellum more strongly metallic, as broad as long, sparingly pilose apically. Pleura unicolorous, brownish olive, with dense cilia on posterior margin of the mesopleura.

Abdomen uniformly glaucous, with greenish tinge, the setulae and bristles sparse and short, but the latter on distal margin of fifth and sixth tergites long.

Legs concolorous with pleura. Wings blackish with black veins.

Length, 3.6 mm.

Type.— ♀ ; Norris Geyser Basin, Yellowstone Park, Wyoming. July, 1923. (C. T. Brues). [A. N. S. P., no. 6507].

HYDROPYRUS[10] new genus

GENOTYPE: *Hydropyrus hians* (as *Ephydra hians* Say, 1830).

Not until I made a study of the genitalia did I consider *Ephydra hians* of sufficient distinctness to be generically separable from

[10] Constructed from the Greek ὕδωρ + πυρος (water-wheat), applied by the Mexican Indians to the larvae of this fly which they use as a food.

Ephydra riparia Fallen, the genotype of *Ephydra*, although I have long recognized certain characteristics in *hians* which are not present in those species I had restricted to *Ephydra*. However I did not consider them of sufficient importance to warrant separating this unique species. A recent, rather intensive study of the species of the several genera constituting the subfamily Ephydrinae, has enabled me to secure better concepts of these genera. In this study, the primary genitalic structure was examined and very marked differentiation was found to exist in the species which otherwise showed very few external characteristics.

It is my intention to publish a revision of the North American species of this subfamily in which the genitalic characters will be taken into consideration in the differentiation of the genera and species.

The very marked difference in the genitalia correlating with certain external characters seems to warrant the erection of this genus although containing, as far as known to me, but one species.

Similar to *Ephydra*, but with the following characteristics: The cruciate interfrontal bristles are situated along the lateral margins of the mesofrons, the series diverging caudad; dorsocentrals arranged 2 : 3, not including the well developed prescutellar or the posterior strong acrostichal pair. The genitalic segment is elongate, with the terminal prongs widely separated, permitting the median paraprocts to be conspicuously developed, and in addition, the superior and inferior claspers of the internally concealed furcula are also well developed as to be readily recognized as such. Of course this furcula cannot be seen until the genital segment is detached or pulled away from the venter. Further characterization would probably be employing those of more specific importance. However, we have in the genotype, a more elongate flatter head than is the case with the species of the other genera, and furthermore, the strongly developed bristling, emphasizes the presence of the macrochaetae.

Scatella laetifica new species

A species of the *stagnalis* group in which the face is ochreous brown; mesonotum and scutellum shining to polished, very sparsely pollinose, not vittate anteriorly; antesutural dorsocentrals and prescutellar acrostichals absent; sutural acrostichals

very strong; lateral scutellar bristle represented by a curved seta. Wings uniformly infuscated with the usual five intervenular lactaceous spots distinct; those in the distal portion of the wing transverse and contiguous with the veins.

Black; halteres tawny. Polliniferous vestiture brown, becoming dense and more ochreous on the face and grayish on the pleura, very sparse on the mesofrons, on disc of mesonotum and on the scutellum, leaving these surfaces shining to polished; abdomen subopaque, sparingly dusted.

Head height, length, width as 44, 38, 65 respectively. Frons two-thirds width of head, about twice as broad as long; mesofrons distinctly broader than long, broadly truncate anteriorly with lateral margins well defined; anteocellar distance twice the transverse intra-ocellar space; parafrons subopaque with two strong frontorbitals, equally spaced with the inner-vertical and with interspersed orbital setulae. Face scarcely one-half width of head, in profile distinctly visible beyond the eyes; prominent medial area strongly setulose, with lateral series of three to four dorso-laterally curved bristles. Oral cilia rather sparse, weak, not much longer than the facial setulae. Cheeks scarcely one-half as wide as the third antennal segment, greenish gray. Arista short haired above to tip.

Mesonotum vestiture more dense at margin, becoming gray on humeri; no suggestion of vittation; dorsocentrals arranged 0 : 2, with two to three antesutural setulae; sutural acrostichals strong with few antesutural setulae; no intra-alar setae nor supra-alar bristles; mesopleura brown pollinous. Scutellum polished, with two apical bristles and a lateral, subapical curved seta.

Abdomen with fifth tergite of male slightly longer than fourth.

Costa not noticeably thickened; second and third costal sections as 94 : 53; second and third sections of fourth veins as 44 : 74.

Length, 1.8 mm.

Type.—♂; Buenos Aires, Argentina. October 21, 1922. (F. & M. Edwards). [British Mus. Nat. Hist.].

Paratypes.—2 ♀; topotypical.

Scatella notabilis new species

A species of the *stagnalis*-group having a small spot in the apex of the submarginal cell. Frons and mesonotum shining to polished; face entirely niveous; scutellum with a subapical lateral seta in addition to the usual apical pair.

Legs entirely black. Frons and mesonotum shining to polished; abdomen shining. Sparingly brown pollinose, more or less cinereous on anterior portion of mesonotum and greater part of

pleura. Wings distinctly infuscated with six rather well marked round lactaceous spots, not contiguous with veins; the sixth, small in apex of submarginal cell.

Head height, length, width as 44; 38; 59. Frons with orbits parallel; mesofrons shining, very sparingly pollinose; anteocellar distance twice transverse intraocellar space; frontalia opaque; parafrons subopaque; frontorbitals equidistant with inner-vertical. Face entirely niveous, in profile projecting one-quarter diameter of eye beyond orbit; medifacies very sparsely setulose with about twenty-five setulae; lateral series of two fine or one strong ventrolaterally inclined bristle, and a strong dorsolaterally inclined bristle at lower angle. Oral cilia short, not as long as upper facial bristles. Arista short haired to tip. Cheeks one-third as broad as third antennal segment.

Mesonotum shining to polished, sparingly dusted on disc, more densely so at margins, with anterior median spot and humeri cinereous; nearly destitute of setulae except a few in usual series; dorsocentrals arranged, 0 : 2; sutural acrostichal strong, but none posteriorly; postsutural intra-alar series of two setae; supra-alar present. Mesopleura brown pollinose. Scutellum convex, with a subapical lateral curved setae in addition to the usual apical pair of bristles.

Abdomen subopaque, almost shining, sparingly dusted; fifth tergite three times as long as fourth, turgid.

Legs normal. Wings with normal costa; second to third sections as 82 : 24; second and third sections of fourth vein as 41 : 62.

Length, 1.5 mm.

Type.—♂; Buenos Aires, Argentina. October 21, 1926. (F. & M. Edwards). [British Mus. Nat. Hist.].

A female from the same locality is very similar except that the frontorbitals are closer together than their distance from the inner-vertical; medifacies and intrafoveal carina dark brown; the facial series contains three equally strong bristles; mesonotum without anterior median cinereous area. Otherwise apparently homomorphic.

Scatella bullacosta new species

Structurally similar to *S. callosicosta* Bezzi (1895), differing in its more shining appearance, especially of the mesofrons. Also similar to *S. costalis* Hendel, described from Kamchatka, differing in its more translucent wings, which in some specimens renders the diluted spots obsolete except in the discal cell. It is also smaller.

Black; halteres tawny, tarsi brown. Subopaque olive gray to ochreous brown, becoming opaque bluish gray beneath. Mesofrons shining to almost polished; face ochreous; abdomen subopaque, glaucous, yellowish pollinose laterally. Wings yellowish, translucent to infumate, not noticeably more intense on superior area, with the usual five diluted to whitish spots which are always weak and often nearly obsolete especially those in the costal area; that in the submarginal cell, when visible, large and quadrate.

Distance between the frontorbitals equal to that from the inner-vertical. Facial setulae minute; the five facial bristles latro-inclinate, the lower one very long; oral cilia about as strong as upper facial bristle. The arrangement of dorsocentrals, 0 : 2; no postsutural acrostichal, the sutural pair strong. The incrassation of the first costal section of the male almost filling the costal cell; second costal section also somewhat thickened.

Length, 2 mm.

Type.—♂; Tainan, Formosa. October, 1909. (H. Sauter). [A. N. S. P., no. 6508].

Paratypes.—4 ♂, 5 ♀; with same data. 3 ♂, 4 ♀; topotypical, April, 1909. 1 ♀; topotypical, April, 1909, [all Hung. Nat. Mus.]. 13 ♂, 43 ♀; Anping, Formosa, (H. Sauter), September 1908, [Deut. Ent. Inst.].

There are now four known species of this genus in which the males have this peculiar thickening of the costa: *obsoleta* Loew, (Nearctic), *crassicosta* Bezzi, *callosicosta* Becker, *costalis* Hendel, (all Palaearctic) and the present Indo-Malayan species.

Canace cala new species

This differs from the other species of the genus known to me by the opaque mesofrons; the presence of only two buccal bristles; the acrostichal setae well marked and seriated.

Black; squamae and halteres, yellow. Opaque; olivaceous, becoming brownish above except on abdomen; face, cheeks, pleura, venter and legs more grayish. Wings infumated.

Frons quadrate or slightly longer than broad; mesofrons not strongly marked except in certain aspects, narrowly attaining lunular margin, with a series of about four marginal setae; frontalia black; parafrons grayish with four orbitals. Face nearly twice as broad as long, slightly concaved in profile, with one bristle near oral margin. Cheeks twice as broad as third antennal segment, with two upcurved bristles, one near eye, the other near lower angle of face, appearing as part of the series of oral setae.

Mesonotum with well developed setulae especially in the acrostichal series; dorsocentrals 1 : 3; mesopleura setulose without ventrally inclined setae; sternopleura sparingly setulose. Length, 2.75 mm.

Type.— ♀ ; East London, Cape of Good Hope, Africa. February 2, 1925. (H. K. Munro). [Transvaal Museum Collection].

CANACEOIDES new genus

GENOTYPE: *Canace nudata* Cresson, 1926.

This genus is separated from *Canace* in having but one pair of interfrontals which are more or less aligned with the anterior ocellus, not removed to the lateral margins of the often short mesofrons. The species here included also have the macrochaetae and setae dark; buccal bristles present; acrostichals wanting or hair-like; scutellum with four marginal bristles.

This may be congeneric with *Procanace* Curran, 1934[11] which name is preoccupied by Hendel, 1913 for a Formosan species of this family.

I include the following species in this genus.

Canaceoides chilensis (Cresson)

1931. *Canace chilensis* Cresson, Dipt. Pat. & So. Chile, VI, p. 116.

Originally described, and known to me only, from Chile.

Canaceoides nudata (Cresson)

1926. *Canace nudata* Cresson, Trans. Am. Ent. Soc., LII, p. 257.

This species is distinguished by the practically bare mesonotum, the few setulae present are on the anterior lateral areas. The mesopleura has a distinct ventrally inclined bristle and there are three buccal bristles.

The species was originally described from California, but the following material from Hawaii seems to be conspecific.

Wawamalu, Oahu, December 17, (E. H. Bryan; beach near Koko crater). Koko Head, Oahu, July 22, (E. H. Bryan). Leahi shore, Oahu, February 26, (Terry). Lisiansky Island, May 19, (C. Grant). Wake Island, July 30, (E. H. Bryan). [Forty-two specimens; Bernice P. Bishop Museum].

This species may be conspecific with *Procanace panamaensis* Curran.[12]

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[11] Pro. Cal. Acad. Sci., XXI, p. 160, (1934).

[12] Proc. Cal. Acad. Sci., XXI, p. 161, (1934).

Canaceoides caffraria new species

Very similar to *C. nudata* Cresson in general color and structure; differing in having only two buccal bristles (these are not to be confused with the anteriorly directed facial bristle at the lower angle of the face) and no discal scutellar bristles.

Black; squamae and halteres yellow. Opaque, gray to silvery below, brownish above. Wings smoky.

Frons much narrowed anteriorly, about as long as width at vertex; mesofrons short, far from attaining lunular margin; bare except the pair of interfrontals which are nearly in line with the anterior ocellus; three strong frontorbitals with interposed setulae. Face as broad as long, slightly concaved in profile with one strong bristle at lower angle. Cheeks slightly broader than third antennal segment; with two strong bristles, which with the anteriorly directed facial, form an oblique series of three bristles.

Mesonotum bare of setulae except a few on the anterior lateral areas; dorsocentrals 1 : 3; scutellum bare with four marginal bristles. Mesopleura and sternopleura at most sparingly setulose the former with a distinct ventrally inclined bristle near lower margin.

Length, 1.75 mm.

Type.—♂; East London. August 9, 1925. (H. K. Munro). [Transvaal Museum Collection].

EXPLANATION OF PLATE XV

Fig. 1—*Beckeriella bispinosa* (Thomson). Profile of head. (× 45)

Fig. 2—*Beckeriella bispinosa* (Thomson). Wing. (× 20)

Fig. 3—*Beckeriella bispinosa* (Thomson). Dorsal aspect of scutellum. (× 25)

Fig. 4—*Beckeriella schildi* new species. Profile of head. (× 45)

Fig. 5—*Beckeriella schildi* new species. Wing. (× 20)

Fig. 6—*Beckeriella schildi* new species. Dorsal aspect of scutellum. (× 25)

Fig. 7—*Beckeriella magnicornis* new species. Profile of head. (× 45).

Fig. 8—*Beckeriella magnicornis* new species. Wing. (× 20)

Fig. 9—*Beckeriella magnicornis* new species. Dorsal aspect of scutellum. (× 25)

Fig. 10—*Beckeriella pendicornis* new species. Profile of head. (× 45)

Fig. 11—*Beckeriella pendicornis* new species. Wing. (× 20)

CRESSON—EPHYDRIDAE

STUDIES IN THE GENUS AUCHMOBIUS LECONTE

(COLEOPTERA: TENEBRIONIDAE)

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(Plates XVI–XVIII)

The preparation of the present paper was begun to describe a species that had for many years been considered as *Auchmobius sublaevis* LeConte. Dr. Geo. H. Horn stated in his Revision of the Tenebrionidae[1] that *sublaevis* occurs in many parts of California, "though rare everywhere." The first step in my study was to ask for the loan of material from collectors and institutions that I knew possessed specimens. The result was most gratifying, eighty-eight specimens were promptly submitted for study. The series presented such a variation in body form, antennal structure and sculpturing that there was scarcely any doubt but what several species were involved, although closely allied, presenting many evident differences, as already surmised by Thos. L. Casey in his Revision of the Tenebrionid Subfamily Tentyriinae.[2] The several species are known to inhabit the geographical area, extending from the southern boundary of California to western San Joaquin County on the north, westward to the vicinity of Paso Robles, Salinas Valley and San Benito County, to and in the foot-hills of the Sierra Nevada Mountains on the east. Few are known to have been taken in the true desert regions, although collected on the border of the Colorado Desert at Vallecitos, the type region; they occur in the semi-desert country and are adapted to withstand long continued drought (Pl. XVII, fig. 27). Mr. Ralph Hopping found a species abundant in Antelope Valley, on the extreme western edge of

[1] Amer. Philoso. Soc., XIV, p. 262, (1864).

[2] Proc. Wash. Acad. Sciences, IX, p. 366, (Oct. 18, 1907).

Kern County, just east of Shandon, which is in San Luis Obispo County, where he collected more than a hundred specimens from an area probably "less than an acre in extent;" they occurred under stones. Small series or single specimens have been taken in other localities, although a species was collected in moderate numbers in Panoche Canyon, San Benito County by Dr. E. C. Van Dyke.

For the loan and gift of specimens I am indebted to the following institutions and colleagues: The American Entomological Society, Philadelphia, for those in the collection Dr. Geo. Horn; Museum of the California Academy of Sciences, which includes the collections of E. C. Van Dyke, Louis S. Slevin, W. G. Wright and the author; Ralph Hopping of Vernon, B. C., Roy S. Wagner of Fresno, California. I am particularly grateful to Mr. P. J. Darlington, Jr., of the Museum of Comparative Zoology, Cambridge, Massachusetts, for comparison of specimens with the LeConte type of *sublaevis*.

Technique

The study of the genitalia becomes more difficult as the species diminish in size. The micro-coleoptera require a more painstaking technique when studied as opaque objects in order to properly describe the normal and unmodified form. As cleared objects mounted in balsam, the procedure is less tedious.

In the species of *Auchmobius* the genitalia are relatively very small. On account of the rareness of the specimens, only the organs of two species have been studied. Fortunately the series from which the specimens were selected had been collected in alcohol and as a result, in a number of cases the retractile abdominal segments were protruded, which greatly faciliated preparation.

Dried specimens were placed in a moistening jar, removed after twelve to twenty-four hours and the genitalia drawn out, cleaned and stripped of membranes and placed in water brought to the boiling point, to more or less restore the normal appearance; then transferred to 60 or 70% alcohol to which some glycerin was added along with a fraction of a drop of phenol. The specimens were allowed to remain in the fluid for two or three days. When ready for the microscopical examination, a speci-

men is removed, placed on a glass slide in a drop of water, with two or three short pieces of thread to support the weight of the cover-glass and prevent crushing. Sometimes it is necessary to fix the specimen in a desired position on a minute smear of balsam on the slide before adding the water. Examine at different angles by direct and transmitted light. Most of my studies have been made on specimens removed from the alcohol, thrown momentarily on blotting paper and then oriented on a minute smear of balsam as before, on the white metallic stage of the microscope and a small drop of water placed on the specimen, no cover-glass being used. Never allow the water to entirely evaporate. The adhesive holds the specimen *in situ* in the semi-globule of water. Examine under good illumination so as to detect the outline and details of surface sculpture. The specimens are to be unmounted in a reversed order. When balsam has been used a little xylol applied with a small camel-hair brush will detach the specimen after the water has been drained off. Remount in different positions after washing in alcohol.

Fallacies

Several fallacies attend the description of a species, the following may be enumerated:

1. Immaturity affects the color of the body and appendages; often darkening of the chitinous skeleton may be delayed or take place in a more or less irregular manner causing color variation; 2. Age of the insect; older the individual, darker the integuments; 3. The relative length of the segments of antennae, palpi and tarsi depend on as to whether or not a segment is retracted or extended; in the latter case the basal condyle becomes visible and the neck between it and the body of the segment is distinctly visible. If retracted the segment is sunken to the neck within the socket of the preceding segment. Any number of segments can be retracted or protruded in an antenna, palpus or tarsus. The above facts cause the organs to apparently vary in length, and is very important from the stand-point of making relative or comparative measurements of the segments. The student should remember these facts when drawing up a description. It is probable that such care is seldom exercised.

Dr. Horn placed *Auchmobius* in the Tribe Gnathosiini in his Revision of the Tenebrionidae, stating that it was removed from the Group Thinobatini, in which it had been placed by LeConte. Col. Casey, with some doubt as regards the propriety or legitimacy, placed it in the new Tribe Auchmobiini, which can be characterized as follows:

Tribe Auchmobiini

Mentum very large, subpentagonal with apex more or less distinctly emarginate, concealing both ligula and palpi in part, buccal fissures closed (Pl. XVIII, figs. 6, 10 and 11). Epistomal lobe abruptly prolonged, and not clasped by the mandibles, which are folded beneath it more or less out of sight when viewed from above (Pl. XVI, fig. 8). Labrum capable of complete retraction beneath the epistomal lobe (Pl. XVI, fig. 7). Mandibles not grooved, nor toothed above. Antennae at times gradually enlarged (Pl. XVII, fig. 4) and compressed distally (Pl. XVII, fig. 7A), variable as regards slenderness and stoutness, as well as the relative length of the segments in the different species. Protibiae not toothed externally near the middle, two terminal spurs are present. Metacoxae more or less moderately separated, abdominal process obtusely rounded at apex (Pl. XVIII, figs. 4 and 5). Elytra not embracing the sides of the body, the inflexed parts occupied chiefly by the epipleurae; apical declivity more or less verruculose in sutural half of each elytron; sides more or less obtusely angulate behind the middle.

The Tribe Auchmobiini is valid and its constituents are easily differentiated by the epistomal lobe being emarginate at apex and not clasped laterally by the mandibles; by sides of the front not forming prominent lateral lobes, the superciliary margin more or less arcuately declivous and not ridged or carinate; by the verruculose apical declivity of the elytra and by the sides of the latter being more or less obtusely angulate behind the middle to about apical fourth. In the most closely related Tribes the epistomal lobe is either rounded or truncate at apex.

AUCHMOBIUS LeConte

1851. *Auchmobius* Leconte, Annals Lyc. Nat. Hist., N. Y., v, (no. 6), p. 139.
1859. *Auchmobius* Lacordaire, Genera Col., v, p. 68.
1866. *Auchmobius* Horn, Trans. Amer. Philos. Soc., xiv, p. 262, pl. 14, fig. 7. (Revision of the Tenebrionidae.)
1883. *Auchmobius* LeConte and Horn, Smith. Miscel. Coll., no. 507, (Classif. Coleop. of N. Amer.), p. 362.
1907. *Auchmobius* Casey, Proc. Wash. Acad. Sciences, ix, (Oct. 18), p. 365.

LeConte's original characterization

Clypeus productus, antice obliquus, apice emarginatus; labrum obtegens; mandibulae obtusae; oculi transversi, haud superciliati; mentum magnum planum, subpentagonum, apice incisum, fissura buccalis nulla. Palpi et antennae desunt. Tibicae anticae haud dilatatae, apice truncatae; coxae posticae approximatae.

Corpus longiusculum convexum, posticae paulo latius, thorace elytris arcte conjunctis, Eurymetopis simile, a quibus clypeo mentoque apice incisis, oculisque haud superciliatis differt.

GENOTYPE: *Auchmobius sublaevis* LeConte.

In response to my request for information regarding the type of *sublaevis*, Mr. P. J. Darlington, Jr., Assistant Curator of Insects, Museum of Comparative Zoology, Harvard University, wrote as follows:

There is only one specimen of *Auchmobius* in the LeConte collection. This is the specimen that has been labeled as the type of *Auchmobius sublaevis* Lec., MCZ no. 4480, by Henshaw. The labels on the specimen are first "Cal.", then "O," and finally "Auchmobius sublaevis LeC.". Both antennae and the palpi on the right side are in perfect condition in this specimen. Since LeConte in his original description notes the antennae and palpi are absent and he had only a specimen which had been found dead, it is obvious that this specimen now in the LeConte collection is not his original type. I have talked this matter over with Mr. Banks and we think that probably LeConte threw away his badly damaged type and replaced it with a comparatively good specimen which he received later. We do not think that there is any possibility that anyone except LeConte can have made the change. The name label on the specimen is in LeConte's own handwriting.

Since this specimen is very likely of the same species as LeConte's original type of *sublaevis* I have made the same comparisons of it that you requested for the type, and I am sending you a camera lucida outline sketch of the protibia (Pl. XVII, fig. 17), which differs somewhat from the form shown in your sketch and which might possibly have been described by LeConte as having the outer apical angle prolonged. As far as I can discover there are no other specimens at all of *Auchmobius* in the Museum here.

Generic Genital Characters

Male. Aedeagus: Edeagophore (Pl. XVIII, figs. 1A, B and C) relatively small, slender, elongate and moderately depressed, about five times as long as wide; inverted when in a state of rest, the middle lobe being superior in position. Apicale longer than the basale, recurved in about apical half as a result of its inverted position; inflexed sides rather widely separated ventrally as far as the base of the apicale, alae not well defined. Genital fossa large, widely open apically, partially closed basad, widely exposing the middle lobe in apical one-half. Middle lobe ligulate,

lateral thirds subchitinous, converging to the obtuse apex, separated by a membranous interval which widens from apex to base. Basale short, scarcely half as long as the apicale; sides inflexed ventrally in apical half only, intervening surface broadly membranous; dorsal wall more or less feebly, sides well chitinized.

Female. Aedeaga: Genital segment (Pl. XVIII, figs. 2A and B) more or less quadrato-triangular. Genital membrane rather widely exposed and not longitudinally rugulose. Chitinous valves ovate when viewed laterally, rather rapidly narrowed apically, apex rather narrowly obtuse; dorsal and ventral plates continuous laterally without margin. Apex not produced, appendix (stylus) rudimentary or entirely absent, fossae small, giving origin to five rather short setiform hairs. Dorsal plate narrower than the ventral, the latter divided by a transverse suture into two sclerites, an apical and a basal, the former triangular, the latter quadrate. Basale or valvifer elongate, at least twice as long as wide, covered dorsally by the anal and rectal canal.

Secondary Genital Characters

The secondary genital characters are not well marked. Males as a rule are less robust, variable in size as are the females. The abdominal segments are unmodified. The most useful character for recognition of sex is the sculpturing of the elytral declivity. In the male the verruculae are sparser, smaller and more lunate. In the female the verruculae more abundant, denser and larger as well as more rounded, flat and polished, at the periphery the punctures are lunate.

Sculpture and Structural Characters in the Species of Auchmobius

Body form more or less robust, varying from ovate to oblong oval. As regards sculpturing the surface is smooth, punctation most abundant and strongest in *sublaevis* Lec.; punctures small, always most distinct on head, pronotum and under side of body, usually extremely feeble on elytral disk but more or less defined laterally and on the apical declivity, where they may be very slightly muricate.

Pubescence limited to and only noticeable on the sides of pronotum, propleurae, humeral area, inflexed sides of the elytra and epipleurae basally but less so distally. The hairs are very sparse, rather long, fine and easily lost; in cabinet specimens usually recumbent and adherent to the surface, in fresh and clean specimens free and easily observed. Thus far only observed

in the type species (Pl. XVI, fig. 1). In the other species the punctures are minutely setigerous, although the setae may be a little longer and more hair-like, especially on the abdomen about the coxae and laterally on the first two segments.

The surface is more or less impressed at sides of the frons at the anterior margin of the eyes (Pl. XVI, fig. 7) and the superciliary regions narrowly and arcuately declivous to somewhat precipitous, never carinate, although extending forward and at times rather sharply bounding the preocular impressions internally. It must be noted that the upper part of the eyes is sunken below the frontal plane.

Sides of the epistoma straight and convergent from the oblique sutures (Pl. XVI, fig. 7), or from a short distance within the same and more or less sinuate (Pl. XVII, fig. 3). Surface of the epistoma more or less convex, the convexity extending laterally on the anterior part of the sides of front, forming the transverse epistomal ridge, well marked in *parvicollis* (Pl. XVI, fig. 2) and obsolescent in the female of *slevini* (Pl. XVII, fig. 3). In the former the epistomal apex is distinctly deflexed, in the latter the apex is scarcely deflexed and the surface quite plane.

Labrum transversely oblong, sides parallel and more or less arcuate, angles rounded, apex broadly but not deeply emarginate; surface more or less feebly convex and finely punctate; lateral and apical margins fringed with setiform hairs, especially on the lobes.

Mandibles stout, outer surfaces feebly impressed (scrobes) toward base and densely punctate; superior margins obtuse and simple, not clasping the sides of the epistoma; apices bicuspid, upper cusp of each larger and subtruncate, the lower subacute, these separated by a triangular emargination.

Mentum flat to feebly convex, sides usually angulate laterally opposite to the apex of the buccal processes (Pl. XVIII, fig. 9), thence rapidly convergent to the narrow and emarginate apex; surface more or less coarsely punctate, peripheral punctures largest and from which arise stout anteriorly bristling setae.

Maxillary palpi elongate, first segment small and cylindrical, usually concealed by the mentum; second segment obconical and elongate, slightly swollen apically and usually quite as long as the third, both twice as long as wide at apex, the third similar in

form to somewhat stouter and slightly constricted internally in basal third; fourth or terminal segment longer than wide, subtriangular, broader apically and slightly constricted basally as seen in *subovalis* (Pl. XVIII, fig. 9), to shorter and subtriangular as in *slevini* (Pl. XVIII, fig. 11), also narrower and elongately suboval as in *sanfordi* (Pl. XVIII, fig. 10). The constriction of a segment on its inner and basal third permits that segment to be flexed quite at right angle to the long axis of the preceding segment. In repose the second segment of maxillary palpus against the genial emargination, the third against the vertical groove on the base of the mandible, while the terminal segment lies in the recess beneath the lateral frontal margin in front of the antennal insertion.

Labial palpi rather slender and usually more or less retracted behind the mentum; first two segments rather short and a little longer than wide and obconical; terminal triangular, constricted basally on inner side and somewhat swollen apically as shown in Plate XVIII, figure 9, and Plate XVIII, figure 11; or the second segment triangular, and the terminal with sides subparallel and more strongly constricted at base as shown in *angelicus* (Pl. XVIII, fig. 7). The differences cannot be due to orientation, as an effort has been made to view at all angles.

The antennae possess specific differences of taxonomic importance: Slenderest in *sanfordi* (Pl. XVII, fig. 5), stoutest in *sublaevis* Lec. (Pl. XVII, fig. 4). Relative lengths and form of the segments will be discussed in the description of each species.

Eyes vary in form in the species, robust and oval, feebly emarginate anteriorly (Pl. XVIII, figs. 13 and 14), to shorter and somewhat bilobed, distinctly emarginate anteriorly and more or less feebly so posteriorly, superior lobe the larger (Pl. XVIII, figs. 15 and 17), or intermediate in robustness and less transverse (Pl. XVI, fig. 7A).

The pronota are transverse and about twice as wide as long on the median line. The basal angles vary in the species from obtuse-angular and distinct (Pl. XVI, fig. 6), narrowly blunt (Pl. XVII, fig. 2), to broadly rounded (Pl. XVI, fig. 2); widest behind the middle and noticeably convergent anteriorly (Pl. XVI, fig. 3), or widest at middle and less convergent anteriorly to apex (Pl. XVI, figs. 5 and 6). The inner surface of the apical angles

have a loose brush of long hairs, which evidently serve to keep the eyes free from dirt, effective when the head is retracted into the prothorax.

The elytra may be more or less inflated, widest behind the middle (Pl. XVI, figs. 1 and 4), or at middle (Pl. XVI, figs. 3, 5 and 6); broadly rounded apically with the sutural angles broad and prominent posteriorly, the submarginal area rather widely impressed (Pl. XVI, fig. 1); moderately rounded at apex and the submarginal area more narrowly impressed, angles not prominent (Pl. XVI, figs. 3, 4 and 5), or the sides more convergent apically, apex more or less ogival or obtusely rounded, angles not in the least prominent and scarcely at all emarginate at the suture (Pl. XVI, figs. 2 and 6). Scutellum triangular, very small when the prothorax is fully extended, scarcely entering between the elytra, beyond the fine, imperfect basal bead.

Epipleurae gradually narrowed from the base and attains the elytral apices; its margins are well marked, the inferior forming a flange in apical half which is clasped, by the moderately expanded and reflexed edges of the last three abdominal segments; surface between the margins concave forming a sulcus that attains the sutural angles, where it is emarginate between the small angles formed by the margins (Pl. XVII, fig. 27). This mechanism is for the purpose of sealing up the membranous abdomen to the elytral apices, to prevent the drying effects of the heat of the semidesert regions which they inhabit.

The apical declivity of the elytra is verruculose in all of the species, involving the sutural half of each elytron. All of the species have the sides of the elytra more or less obtusely angulate from the middle to about one-fourth from apex. One species shows very incipient smooth lines on the elytra, three on each and a very obsolescent one passing forward from the lateral obtuse angulation, below the latter the inflexed surface is quite flat.

The form of the protibiae varies to a moderate degree in the species, gradually widening from base to apex, the latter subtruncate, least broad in *sanfordi* (Pl. XVII, fig. 22) and broadest in *subovalis* (Pl. XVII, fig. 25); the external apical angle is somewhat prolonged in *sublaevis* as stated by Horn and repeated by Casey (Pl. XVII, fig. 17), but not the least so in the other species.

The metafemora and metatibiae are quite equal in length. A long seta arises from the trochanters of the profemora. Meso- and metatibiae moderately slender, gradually and feebly widening from base to apex; or, more slender, feebly widened with sides subparallel, except at the extreme apex where widening is evident (Pl. XVII, fig. 16).

Meso- and metatarsi moderately elongate, slender (Pl. XVII, figs. 19 and 26), or stouter (Pl. XVII, fig. 21); to an intermediate degree in the other species. Protarsi relatively less elongate and slender. The tarsi have spinous hairs beneath. First segment of the meso- and metatarsi moderately compressed ventrally in basal two-thirds. The relative lengths of the tarsal segments are considered under each described species.

Group Synopsis

Form ovate to oval, larger and more robust species; elytra more or less inflated, antennae more or less stout. (Pl. XVI, figs. 1 and 4.) . . . . . Group A

Form subfusiform and somewhat robust, antennae slender; head and prothorax relatively small; elytra distinctly narrowed in apical third, apex subogival. (Pl. XVI, fig. 2.) . . . . . Group B

Form oval to suboblong-oval, antennae moderate in stoutness; elytra more or less broadly rounded at apex, angles not in the least prominent posteriorly. (Pl. XVI, figs. 3, 4 and 6.) Group C

Form oval, antennae slender, similar in the sexes, segments two to nine inclusive obconical and elongate; meso- and metatibiae noticeably dilated at apex. (Pl. XVII, figs. 5 and 16.) Group D

Specific Synopsis

Group A

Elytral punctation minute, surface smooth and more or less shining; apical angles not prominent posteriorly 1

Elytral punctation distinct, rather strong and somewhat dense, surface dull, finely and irregularly creased; apical angles distinctly prominent posteriorly and separated by a distinct triangular emargination at the suture. Antennae stout, intermediate segments thickened (viewed edgewise), gradually widened apicad to the terminal; segments two and three elongate and equal in length. External apical angle of the protibiae more or less produced. (Vallecitos on border of the Colorado Desert and Independance, Inyo County, California.) *sublaevis* LeConte

1. Form suboval (female) to oval (male), more or less robust. Antennae less stout, segments two and four subequal, shorter than the third. Female: segments two, three and four elongate and obconical, fifth to eighth inclusive longer than wide and subobconical, ninth and tenth subtrapezoidal. Male: fourth segment obconico-trapezoidal, seventh to the tenth subtrapezoidal. Elytral apex obtusely rounded, scarcely emarginate at the suture. Protibiae and tarsi rather stout; basal segment of the metatarsi more or less compressed in basal two-thirds ventrally and as long as the third and fourth together. (Antelope Valley, Kern County, California.) *subovalis* new species

Form oval, elytra sometimes widest behind the middle. Sides of epistoma more or less sinuate, transverse ridge scarcely evident (female), or feeble (male). Antennae moderately stout, less so in the male, segments nearly equal in width; segments two to five inclusive obconical and elongate, second, fourth and fifth quite equal in length, twice as long as wide. Metatarsi elongate and moderately stout. Terminal segment of maxillary palpi shorter in the male than in the female. (Between Paso Robles and McKittrick's, 35 miles from the former place, San Luis Obispo County, California.) *slevini* new species

Group B

Sides of the pronotum strongly arcuate, basal angles well rounded. Elytral apex subogival, sutural angles slightly prominent, feebly emarginate at the suture; submarginal surface not impressed across the suture. Antennal segments two to seven inclusive elongate and obconical, second and fourth equal in length. Basal segment of the metatarsi longer than the fourth, second and third equal in length. (Coalinga, Fresno County, California.) ..... *parvicollis* new species

Group C

Elytral apex broadly rounded.

Antennae similar in the sexes, slender, distal segments not widened; sides of pronotum moderately arcuate, subparallel, converging moderately in apical third. Antennal segments two, three and four elongate and obconical, fifth to the eighth inclusive elongate and subconical, ninth and tenth trapezoidal. Sides of mentum strongly arcuate opposite the buccal process. Basal segment of the metatarsi subequal to the fourth, second longer than the third. (Los Angeles, California.) ..... *angelicus* new species

Antennae more or less dissimilar in the sexes, stouter in the female. Sides of pronotum moderately arcuate, widest at

basal third, thence convergent to apex. Female: Antennal segments two to five inclusive elongate and obconical, second and fourth subequal, third scarcely two and one-half times as long as wide, sixth to the tenth more or less trapezoidal, seventh and eighth appear a little wider than long. Male: Antennal segments two to eight inclusive distinctly elongate and obconical, third three times as long as wide and as long as the seventh or eighth, ninth and tenth trapezoidal and as long as wide. (Panoche Canyon, Fresno County and in San Benito County, California.) .*picipes* new species

Elytral apex moderately narrowly rounded.

Antennae somewhat dissimilar in the sexes, slightly stouter in the female; segments two and four equal in length, third more than twice as long as wide. Sides of the pronotum strongly arcuate, widest at about middle and thence converging to apex; basal angles obtuse and distinct. Sides of elytra less arcuate and distinctly convergent in apical fourth. Antennal segments two, three and four elongate and rather stoutly obconical; second subequal to the fifth or sixth, about twice as long as wide, third a little more than twice as long as wide and equal in length to the ninth and tenth together. (Western San Joaquin County, California.).....*subboreus* new species

Group D

Antennae and legs rufous. Antennal segments quite equal in width, second to the ninth inclusive elongate and obconical, second and third equal in length, third about fourth longer than the fourth; fifth to the eighth equal in length, each twice as long as wide. Metatarsi slender, first segment longer than the fourth, second longer than the third. (Jamul, San Diego County, California.).....*sanfordi* new species

Descriptions of Species

Auchmobius sublaevis LeConte (Pl. XVI, figs. 1, 8; pl. XVII, figs. 2, 4, 17; pl. XVIII, figs. 5, 6)

1851. *Auchmobius sublaevis* LeConte, Annals Lyc. Nat. Hist., N. Y., v, p. 140.

1859. *Auchmobius sublaevis* Lacordaire, Genera Col., v, p. 68.

1866. *Auchmobius sublaevis* Horn, Trans. Amer. Philos. Soc., XIV, p. 262. (Revision of the Tenebrionidae.)

1907. *Auchmobius sublaevis* Casey, Proc. Wash. Acad. Sciences, IX, p. 365. (Oct. 13.)

LeConte's original description is as follows:

Oblongus, longiusculus, convexis, ater, subnitidus, thorace subtiliter punctulato, latitudine plus duplo latiore, basi truncato, lateribus paulo rotundatis, elytris subtiliter punctatis pone basin paulo latioribus, versus apicem angustatis, valde declivibus, subtiliter minus dense muricatis. Long. 4. Specimen unicum mortuum ad Vallecitos inventum.

Three specimens in the Horn collection (Amer. Ent. Soc., Phila.) are undoubtedly the *sublaevis* of LeConte; each has "Cal." label and labeled Horn Coll., H 7180. The largest specimen is a female (Pl. XVI, fig. 1), it has sparsely scattered and rather long hairs on lateral pronotal margin and propleurae, also on the elytra in the humeral region and base of the epipleurae; second specimen and next in size is densely verruculose on the apical declivity of the elytra as in the large specimen mentioned above and also a female; the third specimen is the smallest, less dull in luster and the punctation is less strong, the lateral pubescence not evident and probably a male.

Specimens from the collection of the California Academy of Sciences were sent to Mr. Nathan Banks, Curator of the Entomological Department, Museum of Comparative Zoology, Harvard University, who turned the material over to Mr. Darlington, who reported as follows after careful comparison with the LeConte type: "The unique type of *Auchmobius sublaevis* is 9.25 mm. long, about the size of the species you have called *subovalis* n. sp., but is obviously more ventricose than the latter. In form it is more like your *parvicollis* n. sp. (Pl. XVI, fig. 2), but the type, while fully as stout, is not quite so ventricose, for it has a wider prothorax. The type is, of course, much larger than *parvicollis* and differs further in having the suture slightly depressed below the plane of the elytra, besides having the sides of the prothorax less strongly rounded and the basal angles much better defined. These angles are more distinct in the type than in any of the specimens you have sent, but are still obtuse and without any sinuation of the lateral margin. The antennae of the type are thickened at least as much as in *subovalis.* The transverse elevation of the epistoma is about as distinct as in *subovalis* but is more closely and coarsely punctured, about as in *parvicollis.* The elytral sculpture of the type is somewhat closer, coarser and more irregular than in any of your specimens.

Finally the tips of the elytra of the type are more widely and more strongly explanate and more independently rounded at apex than in any of your specimens, that is the elytra together are more deeply and widely emarginate at apex. I do not know what the limits of variation in this genus are, but if the species are fairly constant I should say that none of your specimens can be called *Auchmobius sublaevis* LeConte."

The following is the description of LeConte's type of *Auchmobius sublaevis*, carefully edited by Mr. Darlington from direct comparison with the type:

"Form robust, ovate, noticeably narrowed anteriorly, slightly more than two-thirds longer than wide. Color black, labrum dull rufous, last two antennal segments scarsely more rufous than preceding segments; palpi dull rufous, legs and under surface of body black. Luster dull and alutaceous. Submarginal area of the pronotal disk and propleurae, humeral area of the elytra and epipleural base with rather long, slender and very sparsely scattered hairs.

Head slightly transverse, widest across the eyes, sides before the same evenly arcuate and convergent to the feeble oblique suture; epistomal apex rather deeply and arcuately emarginate, sides straight and convergent, angles moderately narrowly rounded; front slightly and very broadly impressed, vertex moderately convex; punctures of moderate size, very dense on the epistoma, less so laterally, centrally more widely spaced, frontal suture absent. Eyes moderate in size, superciliary region arcuately precipitous, anterior canthi somewhat broadly impressed. Antennae stout, not quite attaining the pronotal base, segments two, three and four elongate, feebly obconical, second and third nearly equal in length, twice as long as wide, fourth one-third longer than wide and about a fourth shorter than the third; fifth to the tenth inclusive triangulo-trapezoidal and a little wider, about as wide as long; eleventh subrhombic and smaller, one-fourth narrower than the tenth and a little longer than wide.

Pronotum twice as wide as long at middle, strongly convex from side to side, apex broadly and arcuately emarginate in moderate circular arc, marginal bead relatively wide, slightly declivous and narrowed on the median line; sides broadly, not strongly arcuate and moderately convergent anteriorly, marginal bead thin and narrow; base transverse in very moderate circular arc, three-fifths wider than apex, angles obtuse and narrowly rounded, bead flat and rather declivous; disk distinctly punctate, punctures moderately small centrally and separated by a distance equal to four to five times their diameters, denser and rather coarse laterally.

Prosternum somewhat flattened and densely punctate, punctures not well defined, annulate, annuli open posteriorly; process arcuate between the coxae, slightly impressed near apex, coarsely and longitudinally rugose between the coxae. Propleurae sparsely punctate, hypopleural punctures large and close, annulate, annuli open anteriorly or externo-anteriorly.

Elytra short oval truncated at base, about one-sixth longer than wide and slightly more than three times as long as the pronotum, strongly convex and more or less moderately inflated, somewhat impressed along the suture; base a little wider than that of the pronotum; sides arcuately deflexed and rather obtusely inflexed, apical declivity arcuate and somewhat broadly but very slightly impressed across the suture; apical submarginal surface rather widely impressed, margins thin and reflexed, sutural angles prominent, divergent and rounded-obtuse at tip; disk densely punctate, punctures well defined with margins very feebly annulate and smooth, denser laterally and apically and slightly muricate, those of the central area of the declivity lunately verruculose to slightly annulate, or rounded, highly polished and with the minute puncture located on the posterior margin of each verrucula; surface more or less finely and irregularly creased. Scutellum triangular, slightly rounded at apex.

Sterna sparsely punctate, punctures moderate in size, more or less annulate, annuli open posteriorly; mesosternal parapleural punctures coarse, reasonably well defined and annulate, those of the metasternal parapleurae as on the sterna. Epipleurae broadly impressed basally and sparsely punctate, punctures more or less setigerous.

Abdomen moderately strongly convex, moderately to sparsely punctate, punctures small especially on fifth segment, slightly larger laterally, those at periphery of first and second segments with rather long and very inconspicuous hairs, which are much shorter and less obvious than those on adjacent epipleurae, visible only in favorable light, most noticeable about the coxae. First segment on median line equal to the length of second, the latter twice as long as the fourth, third and fifth about equal in length.

Legs moderate in length and relatively slender. Each metatibia a little shorter than its metafemur; metatarsi about five-sevenths as long as their tibiae, somewhat slender, first segment of each a little longer than the fourth, second and third together equal to the fourth, second a little longer than the third.

Measurements.—(Type) Length, 9.25 mm.; width, 5.25 mm.

The type of *sublaevis* Lec. has been already discussed by Mr. Darlington on page 227. The following comparative remarks

concern Horn's largest female specimen, which measures 10 mm. in length and 6 mm. in width, and although larger appears to be a good mate for the type of *sublaevis*. The outline of the body is shown by figure 1 of plate XVI, the head and pronotum are moderately flexed so that they are not well presented, to compensate for this the head is shown separately (Pl. XVI, fig. 8), and the pronotum (Pl. XVII, fig. 2); in the figure it is in direct comparison with the pronotum of *parvicollis* (Pl. XVII, fig. 1) our smallest species. The antennae are stout as can be seen by figure 4 of plate XVII; segments five to ten are distinctly widened and trapezoidal, the distal three or four compressed, the eighth, ninth and tenth have the anterior apical angles prominent; segments two to four are elongate, second and third equal in length, the fourth about a fourth shorter than the third; the mentum and maxillary palpi are given in plate XVIII, fig. 6, and the abdominal intercoxal process is outlined, plate XVIII, fig. 5. The conspecific characters are evident in the robust form, elytral apices and pubescence; the punctation is equally abundant and strong in both specimens. The differential characters of *sublaevis* Lec. are given in the synopsis of species.

A specimen very recently loaned to me for study by Mr. L. J. Muchmore, Curator of Coleoptera, in the Los Angeles Museum, Exposition Park, Los Angeles, California, proved to be a true *sublaevis* LeConte. It was collected by Mr. Muchmore at Independance, Inyo County, California, in 1919. A pin label bears the number 2921.

Auchmobius subovalis new species (Pl. XVI, fig. 7; pl. XVII, figs. 6, 7, 21, 24, 25; pl. XVIII, figs. 1, 2, 9)

Form oval to ovate, strongly convex, scarcely twice as long as wide, slightly narrowed anteriorly, at times slightly inflated posteriorly; sides broadly and rather moderately strongly arcuate to less so and subparallel, almost continuous with the pronotal sides. Color black, legs and antennae piceous, last two segments of the latter rufous, palpi and labrum rufous; tarsi rufo-piceous. Surface smooth, luster more or less shining to somewhat dull and feebly alutaceous.

Head relatively moderate in size (Pl. XVI, fig. 7), widest across the eyes, surface broadly plane throughout the central area, moderately convex laterally and on the vertex, superciliary region obliquely declivous to the ocular margin; anterior canthi broadly impressed from the eyes, lateral margins slightly emargin-

ate; frontal suture absent, the oblique feebly indicated, epistomal ridge more or less feeble to obsolete; sides over the antennal insertions broadly arcuate and convergent to the oblique sutures; sides of the epistoma straight and convergent, apex broadly but not deeply emarginate and slightly deflexed, angles rounded. Surface slightly irregularly punctate, punctures discrete, moderate in size and well defined at sides and anteriorly, separated by a distance equal to one or two times their diameters, centrally slightly smaller and a little more widely spaced. Labrum completely retracted in the type (Pl. XVI, fig. 7). Eyes comparatively large (Pl. XVI, fig. 7A) sunken below the frontal plane, facets moderate and feebly convex. Mentum large (Pl. XVI, fig. 9), moderately transverse, about two-thirds wider than long, angulate laterally opposite the tip of the buccal processes, thence the sides are strongly convergent to the narrow and triangularly emarginate apex; surface coarsely and strongly punctate, punctures well separated, several larger ones are present laterally, the peripheral with long, bristling, anteriorly directed setae. Antennae (Pl. XVII, fig. 7) moderately stout, quite similar in the sexes, viewed edgewise the outer four segments show compression and the intermediate relatively thickened, they about attain the pronotal base, the first ten segments are quite equal in width viewed at right angles to their broad surface; segments two to four inclusive elongate and obconical, the second less obconical and subequal in length to the fourth, each twice as long as wide; third most elongate and two and one-half times as long as wide, fifth to the eighth inclusive subequal in length and one-half longer than wide; segments nine and ten trapezoidal, as long as wide, slightly asymmetrical, anterior apical angles rather prominent, eleventh subrhombic, narrower than the tenth and a half longer than wide.

Pronotum about twice as wide as long, widest behind the middle, moderately strongly convex from side to side; apex feebly and broadly emarginate, angles rather broadly rounded; sides broadly and moderately arcuate, more or less convergent before the middle, feebly so posteriorly in basal fourth, bead moderately fine; base transverse, about one-half wider than apex, angles obtusely rounded; disk quite evenly punctate, punctures small but distinctly defined, separated by a distance equal to one to five times their diameters. Sometimes a narrow smooth, impunctate median line is visible.

Prosternum coarsely punctate, punctures not distinctly annulate, surface somewhat rugose; process arcuate between the coxae and margined at the sides. Propleurae narrowly subimpunctate. Hypopleural punctures coarse and annulate, annuli open externally, lunulate at periphery and more or less rugulose on the coxal convexities.

Elytra oval, about a third longer than wide and three and one-half times as long as the pronotum; base truncate, marginal bead fine and more or less interrupted; scutellum triangular and subimpunctate, small when the prothorax is fully extended, not entering between the elytra beyond the basal bead; humeri obtusely angulate and rather narrowly rounded; sides broadly arcuate, parallel, convergent in apical fourth, marginal bead not visible from above except at apex, the latter not lobed, obtusely rounded and subogival; disk strongly convex, arcuately declivous laterally and moderately inflexed, obtusely angulate behind the middle, angulation obsolete one-fourth from apex; apical declivity arcuate and rapidly declivous in about apical fourth, marginal bead thin moderately reflexed, submarginal surface at apex rather narrowly impressed. Surface very finely punctate, punctures shallow, not impressed and inconspicuous, many open posteriorly and their anterior margins may be smooth and more or less shining, separated by a distance equal to two to five times their diameters and simple in the central area, laterally and posteriorly on declivity slightly tuberculate or finely muricate; central area of the apical declivity distinctly verruculose, the verruculae vary in size, are flat, round and polished, lunulate at periphery of the area. A few short, fine hairs are present laterally in the humeral area.

Epipleurae impressed at base beneath the prominent humeral margins, rather wide basally, gradually narrowing to the sutural angles, margins not confluent at apex, surface transversely creased distally.

Sterna and parapleurae coarsely punctate, punctures annulate, annuli open posteriorly, and separated by a distance equal to one or two times their diameters.

Abdomen rather strongly convex, punctures fine and widely spaced in the central area, larger on first three segments and laterally, each puncture with a small seta. First segment on median line twice as long as the fourth and one-fourth longer than the second; post-coxal part equal to the third in length, second as long as the fifth. Metatibiae slightly arcuate apically. Tarsi moderately stout. Metatarsi (Pl. XVII, fig. 21) two-thirds as long as their tibiae; first segment elongate, noticeably compressed latero-ventrally and equal in length to third and fourth taken together; second about a one-third longer than the third, the latter as long as wide, fourth about as long as the second and third together.

Male. Usually smaller, oval to slightly ovate. Verruculae on apical declivity of elytra smaller, less close. Lunate punctures predominating.

Female. Usually larger and subovate. Verruculae larger, more abundant, flat and rounded, fewer punctures lunate at periphery.

Measurements.—(Types) Length, 9.8 to 11 mm.; width, 5.0 to 9 mm.

Holotype.—Female, No. 3784, and *allotype*, male, No. 3785, in the author's collection, Museum of the California Academy of Sciences. Collected by Ralph Hopping, of Vernon, British Columbia, on April 29, 1930, in Antelope Valley, in the extreme west edge of Kern County, just east of Shandon, which is in the extreme north-eastern part of San Luis Obispo County, California.

Paratypes in my own collection, as well as in that of Mr. Hopping and Roy E. Wagner of Fresno, California. Paratypes will also be deposited in the collection of The American Entomological Society and in that of the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts.

A large series, thirty-seven of which were loaned to me for study.

Subovalis is one of the larger species and most closely related to *sublaevis* LeConte. It varies in size from slightly oblong-oval to ovate according to sex, the surface is more or less shining and smooth, punctation of the elytra fine and feeble and not the least impressed. The antennae are moderately stout, not widened distally and apparently quite similar in the sexes; segments two to four are elongate and obconical, fifth to the eighth longer than wide (female) and somewhat intermediate in form between trapezoidal and obconical, nine and ten more trapezoidal with anterior apical angles prominent. In the male segments four to ten are more trapezoidal. Elytral apex obtusely rounded, angles not in the least prominent and separated by a small triangular emargination; submarginal impressed area narrow.

In *sublaevis* LeConte the form is more robust and more or less inflated, punctation stronger and distinct throughout; antennae stouter, segments two to four inclusive elongate, second and third subequal in length; five to ten broadened, and trapezoidal, about as long as wide. Elytral apices prominent posteriorly, rather broad and impressed with the quite broad submarginal area, distinctly separated by triangular emargination.

Genital characters.—Male. Aedeagus (Pl. XVIII, figs. 1A, B and C). Edeagophore slender, relatively very small, elongate and moderately depressed, about five times as long as wide at middle of the apicale; middle lobe superior in position when in a state of rest, the apicale and basale (tegmen) therefore ventral and upwardly curved when protruded from the abdomen.

Apicale (Pl. XVIII, fig. 1AA) elongate and about three times as long as wide, castaneous to testaceous in color and not strongly chitinized, moderately arcuate ventrad; sides moderately and broadly bowed, widest at middle, thence noticeably converging to base, as well as converging more rapidly apically with the lateral edge very broadly sinuate to the obtuse and feebly emarginate apex, the latter slightly membranous at tip, slightly tumid and somewhat bilobed ventrally, surface with a few very short and erect setae. Dorsal surface moderately convex and arcuately deflexed and inflexed laterally, more or less chitino-membranous along the middle third in basal half, a linear impression passes basad from the apical emargination for a short distance; surface without sculpturing, although when viewed obliquely at different angles there appears to be a few rounded, shallow and subfoveate impressions between the linear impression at apex and the lateral margin; base arcuate and membranous centrally, chitinous and sinuate laterally.

Ventral surface with the genital fissure very widely exposing the middle lobe (Pl. XVIII, fig. 1BB), inflexed sides widest in basal half and there separated to the extreme base, their inner margins arcuate and thence broadly sinuate and narrowing to the lateral edge a short distance basad of the apex. Middle lobe ligulate, subchitinous laterally, these lateral moieties separated by a membranous interval which begins narrowly at apex, gradually widens as far as the base of the apicale and exposed between the inflexed sides; the lateral parts are pitted with very shallow and slightly elongate oval impressions. The genital fossa is only moderately concave and evidently attains the base of the apicale. Apex of the middle lobe is very briefly membranous. In the depths of the fossa the lining membrane is reflected on to the middle lobe, constituting the fornix aedeagi.

Basale (Pl. XVIII, fig. 1B) relatively small and suboval, about twice as long as wide, scarcely half as long as the apicale, sides somewhat convergent toward base and chitinous; distinctly membranous ventrally and feebly chitino-membranous dorsally.

Female. Aedeaga (Pl. XVIII, figs. 2A and B). Genital segment quadrate, sides broadly and feebly arcuate as viewed from above or below, pudendal membranes largely exposed and not longitudinally rugulose. Valves not strongly chitinized and castaneo-testaceous in color, each pointed ovate in outline with longitudinal axes quite parallel. Dorsal and ventral plates

arcuately continuous without a dividing lateral margin; apices not produced, blunt and more or less piceous in color, styli absent and fossae small, with four or five short setiform hairs arising therefrom. Surfaces of the valves smooth and shining, sculptured with shallow elongately oval impressions, from each of which arises a rather long slender hair, which for the most part seem to be directed basad; the intervals between the foveolae are correspondingly convex and reticulately continuous, the surface appearing irregular from the reticulo-foveolation. Dorsal plates narrower than the ventral, with the internal margins broadly arcuate and rather widely inflexed. Ventral plates each divided by a transverse suture into two sclerites—an apical and a basal. Apical sclerites twice as long as the basal, each triangular, due to the inner borders converging to the apex. Basal sclerite quadrate, as long as wide, the suture ending at the lateral border which may be indicated by a smooth line; surface arcuately continuous with the dorsal plate, inner margins separated by a membranous interval.

Basale (Pl. XVIII, fig. 2BG) very elongate, about one and a half times as long as the genital segment. Covered dorsally by the rectum and anus (Pl. XVIII, fig. 2BF), these in turn by the proctiger, the latter parabolic and moderately chitinous at apex; dorsal surface more or less chitino-membranous in nearly basal three-fourths; surface somewhat impressed, this condition probably variable, depending on distension and contraction. Ventral margins of the chitinous walls are separated by a membranous interval. The baculi are distinct, surface between each baculus and inner margin rather strongly convex and rather more chitinous; lateral to the baculi the surfaces are sparsely punctate, each puncture with a small hair.

Auchmobius slevini new species (Pl. XVI, figs. 4, 11, 12; pl. XVII, figs. 3, 14, 20; pl. XVIII, figs. 11, 12, 16)

Form oval and rather robust (Pl. XVI, fig. 4), sometimes widest behind the middle, twice as long as wide and about three times as long as the pronotum. Color deep black, labrum, antennae, femora and tibiae more or less rufo-piceous; palpi, coxae and tarsi rufous. Integuments smooth and more or less shining, slightly alutaceous. Fine, short hairs scattered sparsely along the submarginal or impressed area of the elytra from base to apex.

Head widest across the eyes (Pl. XVII, fig. 3), sides arcuate, most so over the antennal insertions, thence rapidly convergent to the feebly marked oblique sutures; epistoma plane and scarcely deflexed at apex, to somewhat convex and distinctly deflexed in about apical half, sides distinctly and arcuately sinuate and

convergent, apex broadly and moderately emarginate, angles well rounded. Sides of labrum feebly arcuate and parallel. Frons rather flat, very broadly and feebly impressed, vertex moderately convex, narrowly and arcuately declivous laterally against the superior ocular margin, quite strongly impressed in front of the eyes on the canthi; surface distinctly and discretely punctate, punctures rather small, more widely spaced centrally where they are separated by a distance equal to one to four times their diameters, denser laterally and on the epistoma, very minute punctules present in the intervals. Eyes (Pl. XVIII, fig. 16) moderately prominent, rather large, distinctly emarginate anteriorly, broadly and feebly so posteriorly, superior lobe distinctly larger than the inferior. Antennae (Pl. XVII, fig. 14) somewhat dissimilar in the sexes (*vide infra*). Mentum as in *sublaevis* LeConte (Pl. XVIII, figs. 11 and 12). Maxillary palpi elongate; third and fourth segments equal in length, fourth a third longer than wide, sides gradually converging to base, third a little narrower and the inner surface somewhat sinuate before the base.

Pronotum transverse, twice as wide as long, base about three-fifths wider than the apex, the latter very broadly emarginate and transverse in middle two-fourths, in rather feeble circular arc, bead flat as usual, apical angles well rounded and not prominent; sides broadly, evenly and moderately arcuate, convergent in apical two-thirds, marginal bead narrow and slightly reflexed; base transverse to very slightly and broadly sinuate laterally, angles obtuse, very slightly rounded, bead flat and comparatively broad; disk broadly and moderately strongly convex from side to side, rather irregularly and strongly punctate, punctures moderately small, separated by a distance equal to two to eight times their diameters.

Prosternum closely and coarsely punctate, laterally the punctures are more or less coalescent and not distinctly defined; process arcuate, coarsely and rugosely sculptured. Propleurae smooth and shining, sparsely punctate, punctures small and finely muricate; hypopleurae rather densely rugoso-punctate, punctures coarse and irregular, more or less lunate and not distinctly defined.

Elytra broadly oval (Pl. XVI, fig. 4) and broadly truncate at base, about three-fifths longer than wide and three times as long as the pronotum; base a little wider than the pronotal base, humeral angles obtusely rounded; sides broadly and moderately arcuate, converging gradually in posterior fourth to the rather broadly rounded apex; disk rather strongly and evenly convex, noticeably declivous at the humeri, apical declivity arcuate and rather abrupt, submarginal impressed area rather broad at apex, sutural angles rounded, not prominent nor divergent, feebly

emarginate at the suture, margin slightly reflexed; laterally arcuately declivous before the middle, posteriorly the obtuse margin is well marked and the deflexed surface below it flat; surface finely and rather closely punctate, punctures feebly defined and not muricate, verruculae on the declivity well developed.

Metasternum sparsely punctate centrally, punctures distinct and coarse, still coarser and larger laterally and not sharply annulate. Mesosternum very densely and coarsely punctate, episternal punctures large, not closely placed, annulate, annuli open posteriorly; epimera not punctate but densely and finely rugulose. Metasternal episternal punctures a little smaller and somewhat annulate as on the meso-episterna.

Abdomen moderately strongly convex, finely but not closely punctate, punctures denser laterally, muricate and with fine hairs on the first segment laterally and about the coxae. First segment on the median line as long as the third and fourth together, post-coxal part as long as the third, second twice as long as the fourth, fifth a little longer than the third. Protibiae (Pl. XVII, fig. 20) rather stout. Metatarsi (Pl. XVI, fig. 11) three-fourths as long as its tibia; first segment as long as the third and fourth together, fourth twice as long as the third, second one-half longer than the third.

Male. Usually smaller, more or less similar in form to the female. Transverse epistomal ridge more or less evident, epistoma deflexed at apex, front rather more impressed. Antennae not quite as heavy, segments two to five inclusive obconical and elongate, third as in the female, two, four and five quite equal in length and twice as long as wide; sixth subobconical, noticeably longer than wide, seven to ten inclusive equal in length and trapezoidal, seventh and eighth as long as wide, ninth and tenth a little wider than long, the anterior apical angles slightly prominent. Verruculae on elytral apical declivity small and not dense.

Female. Usually larger and rather more robust than the male. Epistomal transverse ridge obsolete and front very slightly impressed. Antennae rather stouter than in the male, never as heavy as in *sublaevis* LeConte (Pl. XVII, fig. 4), segments two and three elongate and obconical, the third quite two and one-half times as long as wide, second twice as long as wide; four to ten inclusive trapezoidal and as wide as long, ninth and tenth with the anterior apical angles distinctly prominent, second not as long as the third.

Measurements.—(Types) Length, 10 to 11 mm.; width, 5.0 to 5.5 mm.

Holotype.—Female, No. 3786, and *allotype*, male, No. 3787, in the author's collection, Museum of the California Academy of Sciences. Three specimens collected between Paso Robles and McKittrick's, 35 miles from the former place, San Luis Obispo County, California, on May 10, 1924, by Mr. Louis Slevin of Carmel, California, to whom the species is dedicated. One paratype in my collection.

Slevini is related to both *sublaevis* LeConte and *subovalis*. From *sublaevis* it can be recognized by its smooth and more shining surface, feeble elytral punctation and rounded apex, sutural angles not prominent posteriorly; in the female the epistoma is flat and the transverse ridge feeble or obsolete; in the male the epistomal ridge is more or less evident, the epistomal sides are more or less distinctly sinuate and the feebly deflexed. In *sublaevis* the form is more robustly ovate, and elytral inflation is more or less evident, surface dull and not shining; elytral punctation strong and always distinct, apices prominent and separated by a triangular emargination; the second and third antennal segments are quite equal in length and the distal segments distinctly broader and trapezoidal. In *slevini* the second antennal segment is shorter than the third, longer than the fourth and the latter is similar to the fifth in shape and length.

In *subovalis* the form is more oval than ovate, although rather robust it is less inflated and generally widest at middle of the elytra, surface smooth and shining, elytral punctation is feeble as in *slevini* and the antennae is less heavy; antennal segments are quite equal in width, first three elongate, the second subequal to the fourth; sides of the epistoma straight and the transverse ridge more or less evident.

The three species considered above constitute the *sublaevis* group.

Auchmobius parvicollis new species (Pl. XVI, fig. 2; pl. XVII, figs. 1, 8, 26; pl. XVIII, figs. 8, 14)

Form broadly subfusiform (Pl. XVI, fig. 2), elytra distinctly narrowed in apical third, head and prothorax relatively small, the latter twice as wide as long. Color black, antennae and legs dark rufous; under surface of body piceo-rufous. Luster dull, alutaceous.

Head widest across the eyes, sides over the antennal insertions, broadly, evenly arcuate and moderately convergent to the oblique

sutures; sides of the epistoma straight and convergent, apex broadly emarginate, angles rounded; frons and vertex conjointly and moderately convex, frontal suture obsolete, the oblique short and indistinct; surface broadly and arcuately impressed anteriorly from side to side, from a short distance within the eyes along the epistomal base, accentuating the transverse convex epistomal ridge; epistoma very moderately convex with the apex more or less deflexed. Laterally the front is abruptly and obtusely declivous at the superior ocular margin, the eyes being sunken to a lower level; surface of the anterior canthi is well impressed against and before the ocular margin. Surface densely punctate at the periphery, punctures discrete and rather coarse, scarcely separated by a distance equal to their diameters; in the central area the punctures are a little smaller and more widely separated. Eyes prominent, rather large and comparatively robust, a little more than one-half wider than long (Pl. XVIII, fig. 14) and continuously arcuate with the posterior canthi, facets moderately small. Labrum as usual. Mentum (Pl. XVIII, fig. 8) about a half wider than long, sides angulate and thence straight to the triangularly emarginate apex; surface fairly convex, punctures moderate in size, bristling setae small and inconspicuous. Maxillary palpi slender, second segment obconical and about two and one-half times as long as wide; third segment short and obconico-triangular, about a half longer than wide, fourth suboval, one-half longer than wide, inner surface sinuate in basal third. Antennae (Pl. XVII, fig. 8) slender, distal segments slightly compressed, about attaining the pronotal base; segments two to five elongate and obconical, two to seven equal in width at apex, second and fourth equal in length, each twice as long as wide at apex; third segment longest, scarcely three times as long as wide; segments five to ten inclusive quite equal in length, five to seven scarcely twice as long as wide and subtriangulo-obconical; nine and ten a little broader and about a third longer than wide, subtriangular, eleventh narrower, oval and twice as long as wide, obtusely pointed at apex.

Pronotum transverse (Pl. XVII, fig. 1), scarcely twice as wide as long, widest in basal third and rather strongly convex from side to side; apex slightly emarginate in moderate circular arc, feebly subangulate at middle, bead relatively wide, angles rather broadly rounded; sides moderately strongly arcuate, less so and moderately convergent before the middle and in basal fourth, bead somewhat coarse, slightly reflexed and defined by a linear submarginal impression; base transverse in circular arc, marginal bead not coarse, angles well rounded, a third wider than apex; disk more or less evenly punctate, punctures moderate small, separated by a distance equal to two to three times their diameters.

Prosternum densely and coarsely punctate, punctures annulate, annuli open posteriorly; process arcuate as usual and margined laterally. Propleural area prominent, smooth and more or less impunctate. Hypopleurae densely and coarsely punctate, punctures annulate, open anteriorly, annuli forming lunules.

Elytra about a third longer than wide, three and a third times as long as the pronotum and about a fourth wider, oval; base transverse in feeble circular arc, adapted to the pronotal base, marginal bead fine and enclosing the triangular and transverse scutellum, as seen with the prothorax fully extended; humeri broadly rounded, continuously so with the broadly and rather strongly arcuate sides that distinctly converge in apical third to the subogival and narrowly rounded apex; disk strongly convex, arcuately declivous laterally and somewhat inflexed, not obtusely subangulate behind the middle, apical declivity arcuate; marginal bead rather coarse and somewhat compressed and reflexed, continuous with that of the base at the humeri, submarginal surface impressed in about apical fourth, impression somewhat rugose, gradually widening but not attaining the sutural margin in the type; surface finely and rather densely punctate, punctures separated by a distance equal to one to three times their diameters, their anterior margins slightly glabrous and shining. Sutural area of the declivity with flat, shining and rounded verruculae that vary in size.

Epipleurae sparsely and obsoletely punctulate. Sterna and parapleurae coarsely and closely punctate, punctures annulate, annuli open posteriorly. Mesosternal epimera short and indistinctly punctate.

Abdomen rather strongly convex, sparsely and finely punctate in the central area, punctures coarser laterally, those at the sides of first segment annulate, slightly larger and denser on fifth segment. Post-coxal part of first segment twice as long as the fourth, second one-third longer than third, the latter equal to length of fifth. Legs moderate in length and rather slender. Metatibiae as long as their metafemora. Metatarsi slender, nearly four-fifths as long as their tibia; first segment as long as the third and fourth combined, third one-half the length of fourth, second a little longer than third, the first two and a half times as long as second.

Measurements.—(Type) Length, 8 mm.; width, 4.5 mm.

Type.—Female, No. 3788, in the author's collection, Museum of the California Academy of Sciences. Collected at Coalinga, south-western Fresno County, California, May 9, 1907.

In *parvicollis* the relatively small head and prothorax and well rounded basal pronotal angles are unique characters in the

genus *Auchmobius* LeConte. The antennae are slender, segments two to five elongate and obconical, second and fourth equal in length, third nearly three times as long as wide, ninth and tenth a little broader than the preceding segments. Transverse epistomal ridge well marked. Tarsi slender, basal segment of the metatarsi as long as the third and fourth combined.

Parvicollis constitutes a second group in the genus *Auchmobius*.

Auchmobius angelicus new species (Pl. XVI, fig. 5; pl. XVII, figs. 13, 19; pl. XVIII, fig. 7)

Form oval (Pl. XVI, fig. 5), twice as long as wide. Color black, under surface of body dark rufo-piceous, distal four antennal segments more or less rufous, labrum and palpi rufous. Luster dull and somewhat alutaceous.

Head widest across the eyes, sides of front evenly, broadly arcuate and moderately convergent to the short oblique sutures. Epistoma feebly convex, slightly and arcuately deflexed apically; sides feebly arcuate and convergent, angles moderately well rounded, the apex broadly but not deeply emarginate; punctures discrete, well defined, separated by a distance equal to one to three times their diameters. Frons moderately convex, vertex a little more strongly so, broadly and feebly impressed anteriorly, especially along the line of the obsolete frontal suture; transverse epistomal ridge rather feebly convex although somewhat sharply defined, extending more or less on to the sides of the front; punctures all discrete, slightly denser laterally as on the epistoma, smaller centrally and there separated by a distance equal to one to four times their diameters; laterally the superciliary area rather abruptly and briefly declivous to the superior ocular margin, and extending forward for a short distance and bounding internally the preocular impression. Eyes as usual sunken below the frontal plane, moderate in size and arcuately continuous with the posterior canthi. Labrum as usual. Mentum (Pl. XVIII, fig. 7) not angulate laterally opposite the tip of the buccal process, sides continuously arcuate (type), less so and nearly straight, and convergent to the small, triangular apical emargination; surface sparsely punctate, punctures varying in size, larger laterally and apically, each bearing a moderately long and stout seta. Maxillary palpi slender and elongate; visible segments subequal in length, second obconical and twice as long as wide, third stouter and one-half longer than wide; terminal segment obconico-oval, about a third longer than wide. Labial palpi relatively less elongate, penultimate segment triangular and as wide as long; terminal segment tumid, sides parallel, and a little longer than wide. Antennae (Pl. XVII,

fig. 13) moderately slender, quite equal in length to width of pronotal apex; segments nearly equal in width (male?), second, third and fourth elongate, obconical and slightly stout, second and fourth equal in length, third about a fifth longer than the second; segments fifth, sixth and seventh oblong-trapezoidal, equal in width and about a third longer than wide; eighth, ninth and tenth subtrapezoidal, equal in length and slightly longer than wide, eleventh as long as the eighth and subrhombic-oval.

Pronotum (Pl. XVI, fig. 5) twice as wide as long, widest at middle, evenly convex from side to side; apex broadly but not deeply emarginate in moderate circular arc, marginal bead flat, emarginate on the median line, angles moderately rounded; sides subparallel, evenly and moderately arcuate anteriorly, bead fine; base transverse, about three-sixths wider than apex, angles obtuse, scarcely narrowly rounded, bead wide and flat; disk rather evenly punctate, punctures moderately small, slightly denser laterally, separated by a distance equal to two to six times their diameters.

Prosternum closely and coarsely punctate, punctures discrete and not annulate. Propleurae subimpunctate. Hypopleurae sparsely punctate, punctures small, not or obscurely annulate, annuli when evident open postero-laterally, surface not rugose.

Elytra (Pl. XVI, fig. 5) at least a third longer than wide (width probably variable), three times as long as the pronotum at middle; base transverse, marginal bead fine; scutellum rounded at apex, small when prothorax fully extended; humeri narrowly rounded, sides broadly arcuate and subparallel in basal three-fifths, thence more strongly rounding to the moderately broadly rounded apex, the latter not lobed, sutural angles not in the least prominent and narrowly rounded, emargination at the suture very feeble; disk evenly and strongly convex, arcuately declivous laterally before the middle, distinctly and very obtusely angulate from middle to apical fourth with the deflexed surface flat and quite vertical, corresponding to the beginning and very gradually widening submarginal impression, the latter moderately narrow at apex, margin very feebly reflexed, impressed surface not rugose; apical declivity arcuately oblique. Disk finely and sparsely punctate, punctures separated by a distance equal to two to six times their diameters. Central area of the apical declivity verruculose, verruculae rounded, flat and variable in size, polished, those at the periphery more or less emarginate on their posterior margin, beyond these the anterior lip of the punctures become slightly swollen, polished and lunate. Surface more or less irregularly creased.

Epipleurae rather feebly impressed beneath the humeral margin, very sparsely and finely punctate and with feeble transverse creases. Mesosternal parapleurae coarsely punctate, punc-

tures annulate, annuli open posteriorly. Metasternum sparsely punctate and shining in the middle area, punctures small, those at the sides annulated, annuli open postero-laterally; parapleurae densely and coarsely punctate, punctures annulate and open posteriorly.

Abdomen rather strongly convex, finely and sparsely punctate, punctures larger laterally on first two segments and somewhat denser on the fifth. Post-coxal part of first segment as long as the third, on the median line as long as third and fourth combined; second segment twice as long fourth, fifth as long as the third. Legs moderate in length and stoutness, metatibiae as long as their femur. Metatarsi (Pl. XVII, fig. 19) about two-thirds as long as their tibia; first segment elongate, a fourth of its length longer than the second and third combined, a fifth longer than the fourth, second a third longer than the third.

Measurements.—(Type) Length, 8 mm.; width, 4.5 mm.

Type.—No. 8169, probably a male, in the Horn collection, H7180, American Entomological Society. Type locality, Los Angeles County, California, without other data.

With *angelicus* begins a group of species that are oval to oblong-oval in form. In the *sublaevis* and *parvicollis* groups the form is distinctly ovate and robust, very similar to that of *Cryptadius inflatus* Lec. of the southern Californian sea beaches. The individuals of the species of the *angelicus* group are not inclined to distinct elytral inflation, which is a more or less noticeable characteristic of the preceding groups.

In *angelicus* the elytral apex is broadly rounded, sutural angles not at all prominent and with the sutural emargination feeble; the pronotum is widest at middle, scutellum more rounded at apex, epistomal ridge feeble and the hypopleurae very finely and sparsely punctate. The antennae are slender, but less so than in *sanfordi* (Pl. XVII, fig. 5), segments equal in width, with the exception of the eleventh, sometimes the tenth or even, also the ninth may show some widening; segments two to seven are stouter than in *parvicollis* and *sanfordi*, second and fourth equal in length, third about a fifth longer than the second, fifth to the seventh inclusive oblong-trapezoidal in form and the ninth and tenth are subtrapezoidal. The mentum is not angulate at tip of the buccal process but strongly arcuate. The type of *angelicus* is a unique but possesses characteristics that indicate a distinct species.

Auchmobius picipes new species (Pl. XVI, fig. 3; pl. XVII, figs. 9, 10, 15; pl. XVIII, figs. 4, 17)

Form oval (Pl. XVI, fig. 3), about twice as long as wide, feebly narrowed anteriorly. Color black, feebly tinged with rufous; antennae, palpi and legs rufous, under surface of body dark rufo-piceous. Luster dull and more or less alutaceous.

Head widest across the eyes, sides over the antennal insertions moderately arcuate and convergent from the eyes to the distinct oblique sutures; sides of the epistoma nearly straight and convergent, angles rather broadly rounded, apex widely but not deeply emarginate, deflexed apically; transverse epistomal ridge more or less well indicated. Front and vertex very moderately convex, broadly but not strongly impressed along the line of the obsolete frontal suture, superciliary areas arcuately declivous to the superior ocular margin, very moderately impressed before the eyes, the latter as usual sunken below the frontal plane. Surface discretely and rather densely punctate, punctures well defined, not denser on the epistoma and separated by a distance equal to less to three times their diameters, those of the central area more widely spaced. Eyes (Pl. XVIII, fig. 17) moderately prominent, rather large, somewhat strongly emarginate anteriorly, scarcely at all posteriorly, less than twice as wide as length of superior lobe. Labrum as usual. Mentum slightly transverse, sides angulate opposite the tip of the buccal process, thence feebly arcuate and convergent to the subtriangularly and rather feebly emarginate apex; surface nearly plane, sparsely punctate, punctures not sharply defined centrally, coarser, well defined and setose latero-apically. Antennae (Pl. XVII, figs. 9 and 10) more or less dissimilar in the sexes, moderate in stoutness, extending to the pronotal base or a little beyond, subequal in length to width of pronotal apex.

Pronotum (Pl. XVI, fig. 3) transverse, at least twice as wide as long, strongly convex from side to side, widest a little behind the middle; apex broadly but not deeply emarginate in moderate circular arc, bead coarse and flat, angles rather moderately rounded; sides arcuate, moderately strongly so in basal one-half, less so anteriorly and convergent, marginal bead fine; base transverse in feeble circular arc, three-fifths wider than apex, bead rather wide and flat, angles obtuse and narrowly rounded; discal punctures moderately small, distinctly defined, slightly coarser and somewhat closer laterally, separated by a distance equal to one to five times their diameters.

Prosternum coarsely and closely punctate, somewhat scabrous, process not margined at apex. Propleurae subimpunctate. Hypopleurae not densely punctate, punctures not well defined, annulate, annuli lunate and open externally.

Elytra oval (Pl. XVI, fig. 3), one-third longer than wide, about three and one-half times as long as the pronotum; base truncate, adapted to the pronotal base, bead fine. Scutellum obtusely triangular, transverse and punctate at base, quite within the margin. Humeri obtuse and narrowly rounded. Sides broadly and moderately strongly arcuate, continuously so with the moderately broadly rounded apex, marginal bead not visible laterally from above, except apically where the submarginal surface is moderately widely impressed and feebly, arcuately reflexed; apex scarcely emarginate, sutural angles narrowly rounded and not in the least prominent; disk strongly convex, sides arcuately declivous and somewhat inflexed, behind the middle obtusely angulate to a point about one-fourth from apex, below which the deflexed side is more or less vertically plane; surface finely punctate, punctures shallow but distinctly defined, simple in the central area, separated by a distance equal to five to six times their diameters, somewhat finely muricate laterally toward apex; apical declivity arcuate and verruculose in the parasutural area, verruculae small, varying in size as usual, rounded, slightly convex and polished.

Epipleurae impressed beneath the humeral margins, superior margin thin and feeble throughout, surface more or less transversely creased toward apex. Sterna and metasternal parapleurae not coarsely punctate, punctures well separated and not distinctly annulate; mesosternal parapleurae more coarsely punctate and more or less annulate.

Abdomen moderately strongly convex, finely and rather distantly punctate, punctures slightly coarser laterally on first two segments; denser and more distinctly defined on the fifth segment. Intercoxal process (Pl. XVIII, fig. 4) rounded at apex. First segment behind the coxae quite equal in length to the third, on the median line equal to the second; the latter twice as long as the fourth, fifth equal to the third. Legs moderate in length and rather slender. Metatibiae as long as their femur. Metatarsi (Pl. XVII, fig. 15) two-thirds as long as their tibia; first segment not quite three times as long as wide and a little longer than the fourth; segments two and three equal in length, together two-thirds as long as the first.

Measurements.—(Types) Length, 9.5 to 10.5 mm.; width, 4.8 to 5.2 mm.

Holotype.—Female, No. 3789, and *allotype*, male, No. 3790, in the author's collection, Museum of the California Academy of Sciences. Collected in Panoche Canyon, eastern border of Fresno County, California, by Dr. E. C. Van Dyke, April 23, 1922.

Paratypes in the collections of Mr. Roy S. Wagner of Fresno, California; The American Entomological Society and the Museum of Comparative Zoology, Harvard University.

Twenty-one specimens studied.

Distribution.—CALIFORNIA: Fresno County—Panoche Canyon, April 23, 1922, (Van Dyke). San Benito County—Idria, May 30, 1932; Llamada, May 1, 1933; Mendota, May 17, 1931; Herndon, June 2, 1920, extreme northern border of County, (all by Roy S. Wagner). A specimen taken in Kern County, June, 1930, by Mr. Wagner is doubtfully referred to *picipes*.

Picipes is moderately variable in size, males are oval, females a little more robust and feebly ovate, the smaller individuals of each sex are very similar in form. The antennae differ somewhat in the sexes: Male—Segments two to eight inclusive distinctly obconical and elongate, second and fourth equal in length, third three times as long as wide and twice as long as the seventh or eighth; segments nine and ten trapezoidal and as long as wide. Female—Segments two to five inclusive elongate and obconical, second noticeably a little longer than the fourth, third scarcely two and one-half times as long as wide; segments six to ten more or less trapezoidal and the seventh and eighth appear to be a little longer than wide.

Auchmobius subboreus new species (Pl. XVI, figs. 6, 9, 10; pl. XVII, figs. 11, 12, 18, 23; pl. XVIII, fig. 15)

Form oval (Pl. XVI, fig. 6), twice as long as wide, sides parallel, widest at or slightly behind the middle, elytra noticeably narrowed in apical third. Color black, labrum and palpi rufous, last three antennal segments more or less rufous, legs rufopiceous. Luster dull and more or less alutaceous.

Head widest across the eyes, sides moderately and evenly arcuate, convergent to the feeble but distinct oblique sutures; sides of epistoma straight and convergent, apex broadly but not deeply emarginate, angles rather broadly rounded, surface feebly convex, transverse ridge feeble or scarcely evident; labrum feebly emarginate at apex. Frons broadly and feebly impressed on and from the position of the obsolete frontal suture, vertex rather strongly convex; laterally in the superciliary area briefly and arcuately declivous to the superior ocular margin, surface feebly impressed in front of the eyes. Surface rather evenly punctate, punctures small, well defined, slightly denser laterally and a little more widely spaced in the central area, where they are separated by a distance equal to four to six times their diameters.

Eyes (Pl. XVIII, fig. 15) rather large, not prominent, broadly emarginate anteriorly and posteriorly, twice as wide (transverse) as length of the larger superior lobe. Mentum about one-half wider than long, angulate laterally, thence sides straight and convergent to the narrow and emarginate apex; surface sparsely punctate and feebly convex, punctures smaller centrally, larger and setose at the periphery. Maxillary palpi slender. Antennae (Pl. XVII, figs. 11 and 12) somewhat dissimilar in the sexes, attaining the pronotal base.

Pronotum (Pl. XVI, fig. 6) transverse, twice as wide as long, widest at middle, base about one-half wider than the apex, the latter broadly emarginate in moderate circular arc, bead flat, angles not prominent and well rounded; sides evenly and broadly arcuate, subparallel, convergent in apical third, bead fine and feebly reflexed; base transverse to slightly arcuate, scarcely feebly sinuate laterally, bead flat, angles obtuse and quite distinct; disk moderately convex from side to side, rather evenly punctate, punctures as on the frons.

Prosternum densely punctate, punctures rather coarse and scarcely coalescent, not sharply defined and feebly lunate; process not margined. Propleurae feebly punctate and slightly rugulose. Hypopleurae densely punctate, punctures not large, rather indistinctly lunate, surface more or less rugose.

Elytra (Pl. XVI, fig. 6) a third longer than wide, widest at middle, about three times as long as the pronotum, base transverse and a little wider than the pronotal, humeral angles obtuse; sides broadly and moderately arcuate, subparallel, distinctly convergent in apical third to the comparatively narrowly rounded apex, sutural angles not in the least prominent and narrowly rounded, very slightly emarginate at the suture. Disk rather strongly convex, apical declivity oblique to arcuately declivous; sides arcuately to rather sharply declivous, margin behind the middle more or less obtusely angulate to about one-fourth from apex, deflexed surface beneath plane; punctation rather dense, fine and not distinct, rather more evident laterally and apically; verruculae on declivity rather moderate and flat centrally, lunate at the periphery. Submarginal impressed area at apex rather narrow, margin slightly reflexed. Scutellum triangular and more or less obtusely rounded, scarcely visible when the prothorax is in full extension.

Metasternum discretely and sparsely punctate centrally, punctures larger and lunate laterally, open posteriorly. Mesosternum densely and more or less confluently punctate, punctures of the episterna very coarse and annulate, annuli open posteriorly; punctures of the epimera small and rather obscurely annulate. Meta-episterna less coarsely annulate.

Abdomen moderately convex, punctures small, separated by a distance equal to four to six times their diameters, a little coarser and feebly lunate laterally on first segment, finer on the fourth and fifth segments. First segment on the median line equal in length to that of the third and fourth combined, second as long as the fifth and twice as long as the fourth. Legs moderate in length and rather slender. Metatarsi (Pl. XVII, fig. 18) a little more than two-thirds as long as their tibia; first segment as long as the third and fourth together, second about one-fourth of its length longer than the third.

Male. Rather more narrowed behind. Mentum in the allotype quite broadly and feebly emarginate at apex (Pl. XVI, fig. 9) and therefore more hexagonal, but I regard this character as fortuitous, at least it does not occur in the holotype and paratypes. The terminal segment of the maxillary palpi appears longer and more oval than in the opposite sex. Antennae somewhat more slender, segments two to ten inclusive somewhat of the same width, although the eighth, ninth and tenth may be slightly the wider and trapezoidal; second to the fourth inclusive elongate and rather more stoutly obconical, second and fourth subequal in length and scarcely twice as long as wide; third as long as the ninth and tenth combined and almost two and a half times as long as wide; fifth, sixth and seventh a little longer than wide and somewhat obconico-trapezoidal in form, while the eighth, ninth and tenth are trapezoidal and about as wide as long.

Female. Somewhat stouter and rather less rapidly narrowed behind. Mentum quite as usual, but somewhat more widely emarginate at apex. The terminal segment of the maxillary palpi somewhat more triangular (Pl. XVI, fig. 10). Antennae somewhat more widened in the outer segments, the second to the fourth inclusive as in the male; segments five to the tenth inclusive a little wider and therefore the width more equal to the length. In both sexes the intermediate segments are distinctly thickened when viewed edgewise, the outer four or five compressed as usual.

Measurements.—(Types) Length, 9 to 10 mm.; width, 4.5 to 5.0 mm.

Holotype.—Female, No. 3791, and *allotype*, male, No. 3792, in the Van Dyke collection, Museum of the California Academy of Sciences. Collected in Western San Joaquin County, California, July 19, 1909.

Three *paratypes* in Dr. Van Dyke's collection.

Five specimens studied.

Subboreus has to be differentiated from *angelicus* and *picipes*. In *subboreus* and *angelicus* the pronotum is widest at middle and

behind the middle in *picipes* with the sides more strongly convergent to apex, in the former two species the sides are more parallel. In *picipes* and *angelicus* the elytral apex is broadly rounded; in *subboreus* the apex is much more narrowly rounded as the elytral sides are less arcuate and more strongly convergent in apical third.

In *angelicus* the antennae are slender and the distal segments less trapezoidal, noticeably a little longer than wide, except the ninth and tenth, and there is less difference between the length of segments two, three and four. These are also, relatively stouter. In both *subboreus* and *picipes* the antennae are more or less dissimilar in the sexes, stouter in the female than in the male. In the male of *picipes* segments two to eight inclusive are elongate, five to eight less trapezoidal and the second, third and fourth obconical; in the female segments five to ten inclusive are wider and therefore more trapezoidal. In *subboreus* the antennae are less stout; in the male the eight, ninth and tenth segments are trapezoidal, while the preceding segments are longer than wide and somewhat obconico-trapezoidal, the second and fourth are subequal in length; in the female segments five to ten are wider and more trapezoidal. There is more or less variation due to the size of the individuals.

In *angelicus* the metatarsi are slender and the second segment is longer than the third; the species southern in habitat. In *picipes* the metatarsi are stouter and the second and third segments are equal. In *subboreus* the metatarsi are more elongate, stouter and the first segment is as long as the third and fourth together, second segment is distinctly longer than the third; northern in habitat.

Auchmobius sanfordi new species (Pl. XVII, figs. 5, 16, 22; pl. XVIII, figs. 10, 13)

Form oblong-oval to slightly ovate, about two and a third times as long as wide. Color black to piceous, under surface of body rufo-piceous, legs and antennae rufous. Luster dull and alutaceous.

Head widest across the conjointly arcuate eyes and posterior canthi, sides over the antennal insertions broadly and arcuately convergent to the oblique sutures; thence the sides of the epistoma straight and convergent, angles rounded, apex broadly

and arcuately but not deeply emarginate. Frons broadly and quite feebly impressed on the obsolete frontal suture, transverse epistomal ridge scarcely evident; superciliary area arcuately declivous to the superior ocular margin and the surface briefly impressed before the eyes; discretely punctate, punctures small in the central area and on the vertex, separated by a distance equal to four to six times their diameters, larger at the periphery especially in the epistomal area, where they are separated by a distance equal to one or two times their diameters. Eyes robust (Pl. XVIII, fig. 13), suboval, feebly and broadly emarginate anteriorly, three-fifths wider than long; facets moderate in size, each feebly convex. Labrum as usual. Mentum (Pl. XVIII, fig. 10) about a half wider than long, distinctly angulate laterally, thence the sides are rapidly convergent and broadly more or less sinuate to the narrow and triangularly emarginate apex; surface sparsely and coarsely punctate, peripheral punctures setose, setae rather long and rigid. Maxillary palpi slender, segments elongate, second and third obconical and subequal in length; terminal suboval and twice as long as wide.

Antennae (Pl. XVII, fig. 5) slender, about attaining the pronotal base; segments two to ninth inclusive elongate and obconical, second two and one-half times as long as wide and equal to the fourth in length, third three times as long as wide and a fifth longer than the second; fifth to the eighth inclusive equal in length, each about twice as long as wide at apex, ninth a third longer than wide; tenth widest, subtriangular, as long as wide, preceding segments of equal width and not widened; eleventh narrowest, as long as the ninth and subfusiform oval.

Pronotum transverse, not quite twice as wide as long, widest at basal third, apex broadly and feebly emarginate in less than moderate circular arc, marginal bead narrow and flat, angles well rounded and not prominent; sides broadly and moderately arcuate, converging from a little before the base to apex, marginal bead thin, feebly reflexed and defined by a linear submarginal groove; base feebly arcuate, sometimes very broadly and feebly sinuate laterally, about two-fifths wider than apex, bead coarse and flat, angles obtuse and slightly rounded; disk strongly convex from side to side, punctures in the central area small but little larger than those of the corresponding area of the frons, separated by a distance equal to two to four times their diameters, laterally larger and more closely placed.

Prosternum densely and coarsely punctate, punctures not sharply defined or annulate; process arcuate as usual. Propleurae nearly impunctate, punctures small. Hypopleurae rather sparsely punctate, punctures annulate, annuli open anteriorly forming lunules; surface feebly and longitudinally rugulose.

Elytra oval, about three-sevenths longer than wide, three and one-third times as long as the pronotum; base transverse, a

little wider than the pronotal base, marginal bead fine, scutellum small, triangular, scarcely entering between the elytra; humeri broadly rounded and simple, sides broadly arcuate, marginal bead not visible when viewed from above except in apical third, where the sides more rapidly converge to the subogival apex; marginal bead narrowly reflexed, submarginal impressed surface linear in basal two-thirds, thence gradually widening to apex to be rather narrow, sutural angles not in the least prominent, very slightly emarginate at the suture; disk strongly convex, most so laterally where the surface is declivous and more or less inflexed, not noticeably obtusely angulate behind the middle; apical declivity more or less arcuate and oblique to the impressed submarginal area; surface rather densely punctate, punctures small, separated by a distance equal to two to eight times their diameters, not noticeably denser laterally; anterior margin of each puncture microscopically thickened, flat, glabrous and shining, the declivity verruculose in the central or sutural area, verruculae moderate; setae of the punctures extremely minute.

Epipleurae finely and very sparsely punctulate, more or less transversely creased in distal third. Sterna and parapleurae moderately closely punctate, punctures large, shallow and annulate, annuli open posteriorly.

Abdomen rather strongly convex, rather sparsely punctate, punctures small, those at sides of first segment larger and feebly annulate, smaller and somewhat denser on the fifth; first four segments more or less impressed laterally. Post-coxal part of first segment equal in length to the third, second not quite twice as long as the fourth, fifth as long as the second and twice as long as the fourth. Legs slender and moderate in length; femora not inflated, metatibiae as long as their femur; meso- and metatibiae noticeably dilated at the extreme apex (Pl. XVII, fig. 16). Metatarsi about five-sevenths as long as their tibia; first segment (Pl. XVII, fig. 16) three times as long as the third, fourth twice as long as the second, the latter about a third longer than the third. Protibiae comparatively slender (Pl. XVII, fig. 22).

Sexes. Elytra usually widest at middle, sometimes slightly widest behind the middle in the male.

Measurements.—(Types) Length, 9.5 to 10.0 mm.; width, 5.0 to 4.5 mm.

Holotype.—Female, No. 3793, and *allotype*, male, No. 3794, in the author's collection, Museum of the California Academy of Sciences. Collected by Mr. O. N. Sanford near Jamul, south of San Diego, California.

Three *paratypes* in my collection and one in that of The American Entomological Society.

Six specimens studied.

Sanfordi is easily recognized by the slender antennae, rufous legs and dull luster. The antennae are similar in the sexes, the intermediate segments are not thickened and of equal width, the tenth may be very slightly wider; segments two to nine inclusive are obconical and longer than wide, the second to the fifth conspicuously so, the second and third are three times as long as wide and subequal in length. *Sanfordi* is slightly more robust in the females, in the extremes there is scarcely any difference, apparently never ovate nor inflated. The species was collected in the early 'eighties and up to the present time has been labeled *sublaevis* Lec. It has not to my knowledge been taken in recent years, probably because collectors have not visited the region. I believe that species of *Auchmobius* will be found in the adjacent regions of northern Mexico. Jamul the type locality is a little south of east of San Diego and about ten miles from the Mexican boundary.

Comments

The method of collecting and mounting of insects for study means a great deal to the taxonomist. These facts have been emphasized during the course of the present study, when it became necessary to attempt to remove the genitalia from uniques or very limited number of specimens of a species.

Many collectors make it a practice to collect Tenebrionids in cyanide bottles instead of alcohol and, on removal, too frequently put them away in air tight boxes, even between layers of cotton. Specimens shut off from the air dry very slowly and the soft tissues of the body mascerate; later when they are dampened for mounting or for the removal of the genitalia, the insect falls apart and is ruined. At all times specimens should be exposed to the air and allowed to dry as rapidly as possible.

In the cyanide bottle the specimens regurgitate their gastric contents and become more or less smeared with the egesta, and almost useless for study. The egested material is very difficult of removal when it once becomes dried, unless removed with a soft brush after being placed in weak alcohol.

It is excusable to place the smaller and winged species in the cyanide bottle, as they are apt to spread their wings, but should be removed and placed in alcohol for the reasons mentioned above. Wingless species should always be collected in 95 per cent

alcohol. However, should it be desirable to have the retractile abdominal segments protruded, 70 per cent alcohol can be used, but in a few days the specimens must be transferred to the stronger alcohol. Formalin may be added to about 3 per cent, but the objection is that the tissues become rigid, rendering the appendages difficult of manipulation and consequently more or less sprawly, take up too much room and subject to breakage. The above facts indicate why the genitalia of all the species of *Auchmobius* have not been studied.

The study of the genitalia of the Tenebrionidae indicates very definitely that changes should be made in the taxonomic sequences of Subfamilies and Tribes. The character which is most significant in suggesting such changes, is the position of the edeagophore of the male when in a state of rest within the body and when first protruded therefrom. By this criterion the Tenebrionidae can be divided into two major divisions: 1st, those species in which the middle lobe of the aedeagi is superior and the tegmen inferior; 2nd, those species in which the middle lobe is inferior and the tegmen superior. In the one division the organ is in a reversed position to what it is in the other.

In the first division the dorsal position of the middle lobe appears to be a characteristic of the true Tentyriinae. All of the Subfamilies which follow and include the Scaurinae as given in the Leng Catalogue, belong to the second division of the Tenebrionidae, all having the middle lobe of the edeagophore ventral in position. As regards the order of the Tribes in the Tentyriinae, they can for the present remain as given in the Leng Catalogue, with the following exceptions: The Coniontini should follow the Trimytini, not as a Subfamily but as a Tribe; its present position is wholly at variance with the Subfamilies that have the middle lobe of the aedeagi ventral, as in the Eleodiinae, Pedininae and Helopidae. The Craniotini possess genitalia wholly Asidine in character and should precede the Asidini in our lists.

The above changes in the arrangement of the Tribes are positively indicated, while in the main the tribal sequences can tentatively remain as given in Leng's Catalogue of the Coleoptera, until further research has been done, as the studies are far from being complete.

Explanation of Plates

Camera lucida drawings

Plate XVI

Fig. 1.—Outline of body form of *Auchmobius sublaevis* LeConte, female. Horn's largest specimen. California.

Fig. 2.—Outline of body form of *Auchmobius parvicollis* new species, female type. Note the transverse epistomal ridge, extending laterally on to sides of the front. Coalinga.

Fig. 3.—Outline of body form of *Auchmobius picipes* new species, male. Panoche Canyon, Fresno County.

Fig. 4.—Outline of body form of *Auchmobius slevini* new species, female type. Note absence of transverse epistomal ridge. Near Paso Robles.

Fig. 5.—Outline of body form of *Auchmobius angelicus* new species, type. Los Angeles.

Fig. 6.—Outline of body form of *Auchmobius subboreus* new species. San Joaquin County. Male.

Fig. 7.—Outline of head of *Auchmobius subovalis* new species, showing completely retracted labrum and maxillary palpi; 7A, eye. Note the feebly emarginate anterior canthi and impression before the eyes. Female. Antelope Valley, Kern County.

Fig. 8.—Outline of head of *Auchmobius sublaevis* LeConte, showing labrum fully extended; 8B, eye. Horn's largest specimen.

Fig. 9.—Showing mentum and maxillary palpi of *Auchmobius subboreus* new species, male allotype. Note the unique truncate apex of mentum, probably fortuitous. San Joaquin County.

Fig. 10.—Showing mentum and maxillary palpi of *Auchmobius subboreus* new species, female holotype. San Joaquin County.

Fig. 11.—Showing right metatarsus of *Auchmobius slevini* new species. Dorsal view.

Fig. 12.—Showing left mesotarsus of *Auchmobius slevini* new species. Dorsal view.

Plate XVII

Fig. 1.—Pronotum of *Auchmobius parvicollis* new species, female type. Superimposed on that of fig. 2, to show the extremes of pronotal development in the genus *Auchmobius*.

Fig. 2.—Pronotum of *Auchmobius sublaevis* LeConte, female. Horn's largest specimen.

Fig. 3.—Head of *Auchmobius slevini* new species, female type. Note absence of the transverse epistomal ridge and sinuate sides of the epistoma.

Fig. 4.—Left antenna of *Auchmobius sublaevis* LeConte, female. Horn's largest specimen. Note the long second segment, quite equal to the third.

Fig. 5.—Left antenna of *Auchmobius sanfordi* new species, male type. Note the slenderness and elongate segments. Jamul, San Diego County.

Fig. 6.—Right antenna of *Auchmobius subovalis* new species, male type. Note the shorter second segment.

Fig. 7.—Left antenna of *Auchmobius subovalis* new species, female type; A, same viewed edgewise; B, basal segment. Note that the second and fourth segments are subequal in length.

Fig. 8.—Right antenna of *Auchmobius parvicollis* new species, female type. Note the slenderness and that the second and fourth segments are quite equal in length.

Fig. 9.—Left antenna of *Auchmobius picipes* new species, female. Note the moderate stoutness.

Fig. 10.—Left antenna of *Auchmobius picipes* new species, male. Note the elongate fifth and sixth segments.

Fig. 11.—Right antenna of *Auchmobius subboreus* new species, female. Note the similarity between it and that of fig. 12.

Fig. 12.—Right antenna of *Auchmobius subboreus* new species, male.

Fig. 13.—Right antenna of *Auchmobius angelicus* new species, male. Note the slenderness and the elongate fifth segment.

Fig. 14.—Right antenna of *Auchmobius slevini* new species, female. Note the stoutness and that the fourth segment is similar to the fifth.

Fig. 15.—Left metatarsus of *Auchmobius picipes* new species.

Fig. 16.—Right metatarsus of *Auchmobius sanfordi* new species, female.

Fig. 17.—Left protibia of *Auchmobius sublaevis* LeConte, type. Outline by J. P. Darlington of the Museum of Comparative Zoology, Harvard University, Cambridge, Mass.

Fig. 18.—Left metatarsus of *Auchmobius subboreus* new species, female.

Fig. 19.—Right metatarsus of *Auchmobius angelicus* new species.

Fig. 20.—Left protibia of *Auchmobius slevini* new species, female.

Fig. 21.—Left metatarsus of *Auchmobius subovalis* new species, female. Note stoutness and that the sides of the first segment is compressed ventrally.

Fig. 22.—Left protibia and tarsus of *Auchmobius sanfordi* new species.

Fig. 23.—Right protibia and tarsus of *Auchmobius subboreus* new species, female.

Fig. 24.—Left protibia and tarsus of *Auchmobius subovalis* new species, male.

Fig. 25.—Right profemur and tibia of *Auchmobius subovalis* new species, anterior surface. Female.

Fig. 26.—Right metatarsus of *Auchmobius parvicollis* new species, female.

Fig. 27.—Subdiagrammatic view of apical epipleural flange and clasping edges of the last three abdominal segments in the genus *Auchmobius* LeConte.

Plate XVIII

Fig. 1.—Aedeagus of *Auchmobius subovalis* new species, male. Showing edeagophore: 1A, dorsal view of tegmen or inferior surface in a state of rest; 1B, ventral view with the middle lobe superior in a state of rest; 1C, lateral view of the same. A, apicale; B, basale; C, inflexed sides of the apicale; D, duct; G, basale of valvifer.

Fig. 2.—Aedeaga of *Auchmobius subovalis* new species, female. 2A, dorsal view; 2B, lateral view. E, proctiger or anal plate; F, anus; G, basale or valvifer.

Fig. 3.—Aedeaga of a species of *Auchmobius* taken at Banning, Calif. 3A, dorsal view; 3B, ventral view; 3C, lateral view. H, dorsal plate of valve or coxite; J, apical sclerite of ventral plate; K, basal sclerite of same; L, basale or valvifer.

Fig. 4.—Intercoxal abdominal process and metasternum of *Auchmobius picipes* new species, female.

Fig. 5.—Intercoxal abdominal process and metasternum of *Auchmobius sublaevis* LeConte, female. Horn's largest specimen.

Fig. 6.—Mentum and maxillary palpi of *Auchmobius sublaevis* LeConte, female. Horn's largest specimen.

Fig. 7.—Mentum and palpi of *Auchmobius angelicus* new species, more highly magnified. Horn's specimen, type no. 8169. Note the arcuate sides and the extended labial palpi.

Fig. 8.—Mentum and maxillary palpi of *Auchmobius parvicollis* new species, female.

Fig. 9.—Mentum and palpi of *Auchmobius subovalis* new species, female. Note the long setiform hairs.

Fig. 10.—Mentum and palpi of *Auchmobius sanfordi* new species, male. Note that the mentum is transverse and short, labial palpi retracted.

Fig. 11.—Mentum and palpi of *Auchmobius slevini* new species, male. Note the short terminal segment of the maxillary palpi.

Fig. 12.—Mentum and maxillary palpi of *Auchmobius slevini* new species, female.

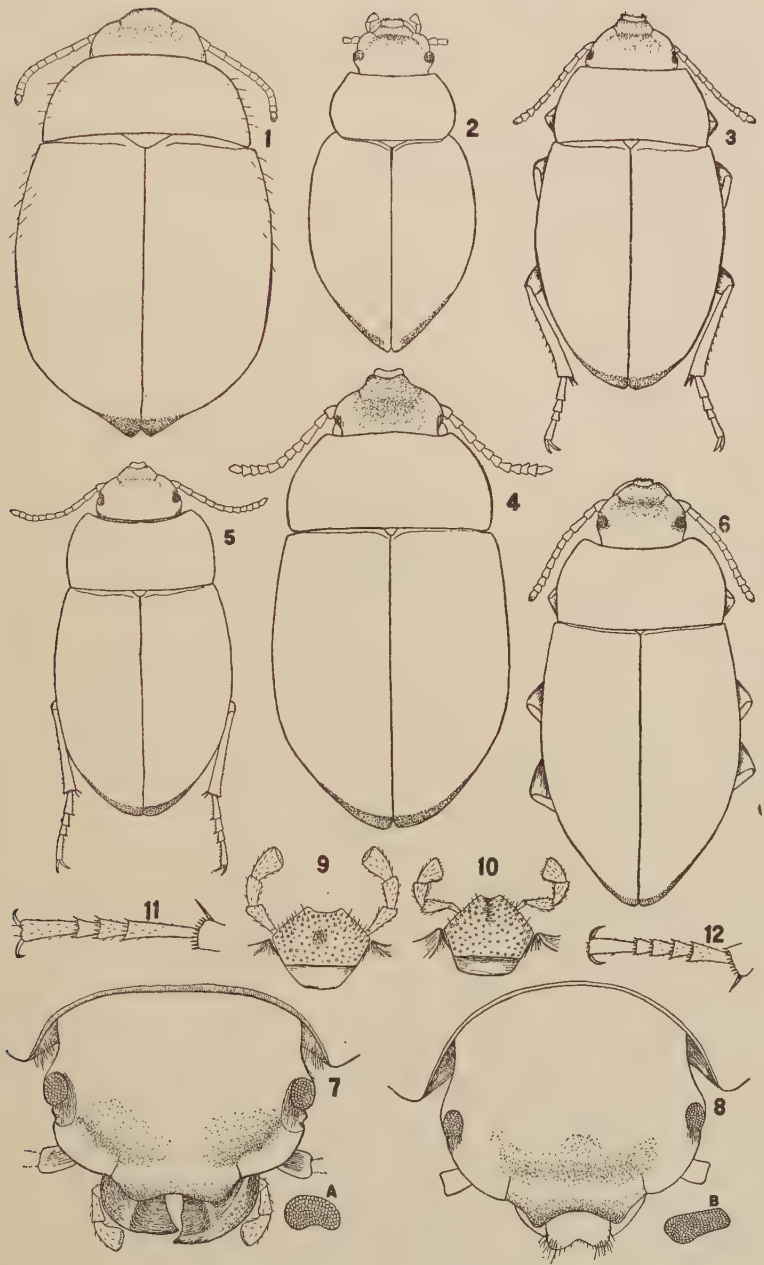
Fig. 13.—Outline of the eye of *Auchmobius sanfordi* new species. Two-thirds wider (transversely) than long. Note the feeble anterior emargination as indicated by the arrow.

Fig. 14.—Outline of the eye of *Auchmobius parvicollis* new species, female. Two-thirds wider (transversely) than long.

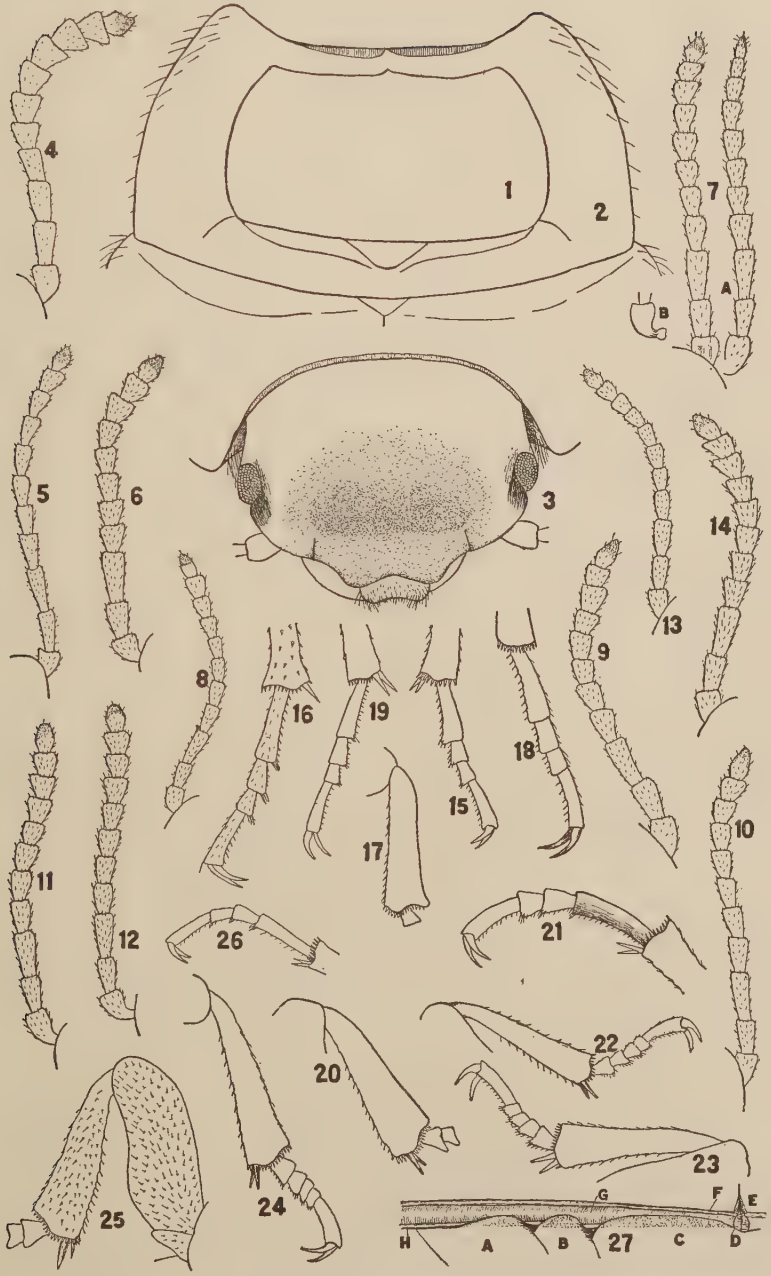
Fig. 15.—Outline of the eye of *Auchmobius subboreus* new species, female. Twice as wide (transversely) as long. Posterior emargination due to the arcuate anterior margin of the tempora.

Fig. 16.—Outline of the eye of *Auchmobius slevini* new species, female. Nearly twice as wide as long.

Fig. 17.—Outline of the eye of *Auchmobius picipes* new species, female. Three-sevenths wider than long. Posterior emargination feeble.



BLAISDELL—AUCHMOBIUS



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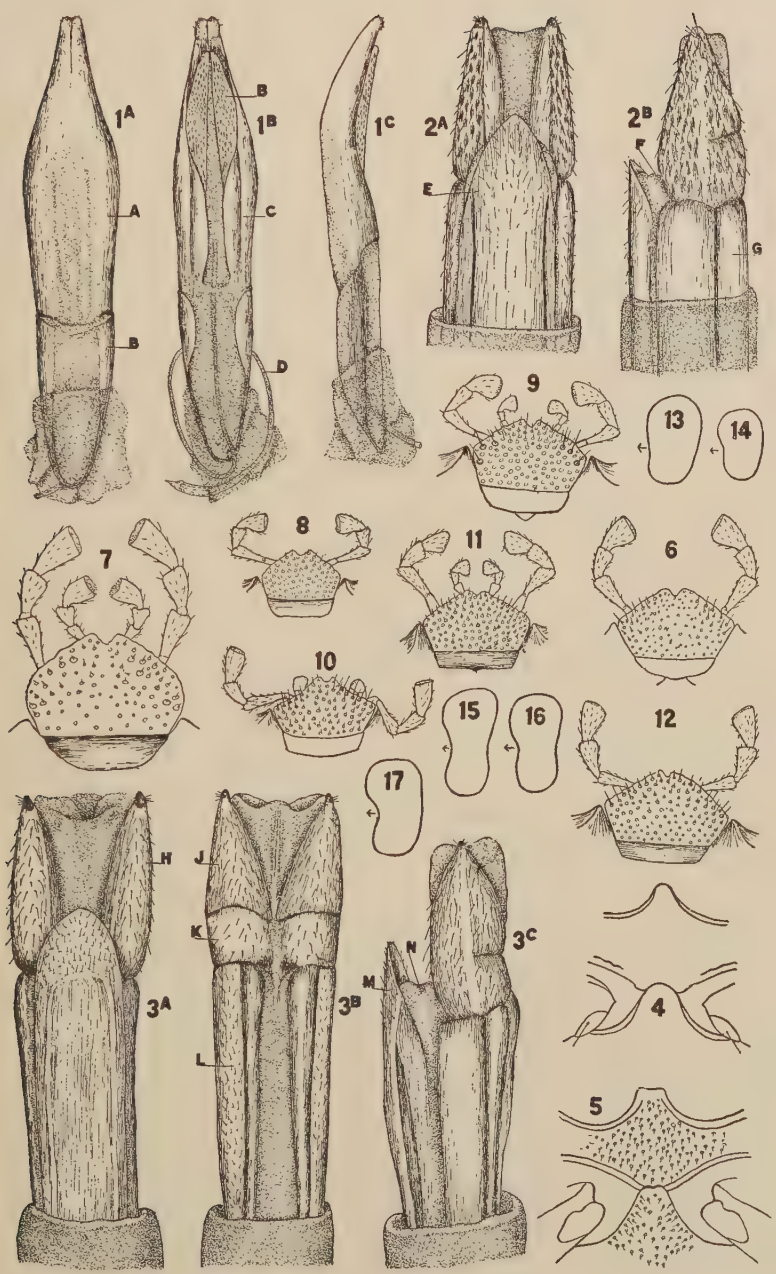

BLAISDELL—AUCHMOBIUS

STUDIES IN THE AMERICAN HESPERIOIDEA

PAPER IV

(LEPIDOPTERA)

BY ROSWELL C. WILLIAMS JR., AND ERNEST L. BELL

(Plate XIX)

ON THE SYNONYMY AND THE MALE GENITALIA OF SOME SPECIES

Pyrrhopyge zeleucus (Fabricius)

1793. *Hesperia zeleucus* Fabricius, Ent. Syst., III, (1), p. 346. ["In Indiis".]
1931. *Pyrrhopyge williamsi* Bell, Journ. New York Ent. Soc., XXXIX, p. 430, pl. 35, fig. 14, (male genitalia). [Peru, Venezuela, Trinidad, Colombia.]

A specimen of *williamsi* from Trinidad has been sent to Capt. N. D. Riley, of the British Museum, who has kindly compared it with the specimen in the Museum, labelled "*Tamyris zeleucus*," and confirms that it appears to be the same species, *williamsi* therefore falling to *zeleucus*.

Achalarus toxeus (Plotz) (Pl. XIX, fig. 1)

1882. *Aethilla toxeus* Plotz, Berlin Ent. Zeit., XXVI, p. 258. [Mexico.]
1907. *Aethilla toxeus* Godman, Ann. & Mag. Nat. Hist., (7), XX, p. 136.
1912. *Murgaria albociliata* var. *nigrociliata* Mabille & Boullet, Ann. Sci. Nat. Zool., (9), XVI, p. 158. [Mexico.]
1922. *Murgaria toxeus* Draudt, in Seitz Macrolep., V, p. 875.
1922. *Murgaria albociliata nigrociliata* Draudt, in Seitz Macrolep., V, p. 875.

In all of the collections examined by the writers, three distinct species have been found confused under the name *albociliatus* Mabille, all of them having a very similar superficial appearance. One of these appears to be an undescribed species belonging in another genus. The other species, while very closely resembling

albociliatus in superficial characters, differs in having a costal fold in the male. In the National Museum in Washington there are two specimens of this same species, one having the fringes of the secondaries entirely dark, and the other having them sordid, pale brown in the lower half of these wings and it is apparently this species and not *albociliatus* which varies in having the fringes of the secondaries range from pure white to brown, as in the considerable number of specimens of *albociliatus* examined the fringes of the secondaries were invariably white.

Dr. Martin Hering, of the Berlin Museum, informs the writers that the Plotz type of *toxeus* is a female and that the wings are now without fringes but that it well agrees with a male specimen from Mexico, having a costal fold on the primaries.

Both Godman and Draudt ascribe dark fringes to *toxeus*, presumably from the Plotz figure of the type. Mabille & Boullet's description of *nigrociliata* apparently refers to the same insect and therefore falls as a synonym.

The prevailing form of *toxeus* has white fringes on the secondaries but there seems no real use in applying a distinguishing name to this form as it and various intergrades to those having entirely dark fringes are all found in the same general region. It is fortunate that the name *nigrociliata* does not have to be applied to an insect usually found with white fringes on the secondaries.

There does not seem to be any superficial character except the costal fold of the primaries that will serve to accurately separate the males of *toxeus* from those of *albociliatus* when the fringes of the secondaries of the former are white and as the costal fold is lacking in the females the separation of this sex from the females of *albociliatus* is a matter of uncertainty.

There are specimens of *toxeus* in the National Museum, The Academy of Natural Sciences, Philadelphia, The American Museum of Natural History and the Bell collection from various Mexican localities in the State of Sinaloa and southward to Guatemala.

The form of the male genitalia materially differs in detail from that of *albociliatus* and is alike in individuals having either entirely white or dark fringes of the secondaries. The uncus is similar to that of *albociliatus*, terminating in two slender arms.

The scaphium is well developed but rather short. The aedoeagus carries a large internal spine towards the base. The claspers are rather long, the terminal arm somewhat slender and slightly curved upward at the apex, which is pointed.

Toxeus is very close to *coyote* Skinner from which it differs in having a strong costal fold, in *coyote* the fold, while present, is very short and thin, and in the genitalia the terminal arm of the clasper is pointed, not rounded as in *coyote*.

Aethilla echina Hewitson

1870. *Aethilla echina* Hewitson, Equat. Lep., p. 70. [Rotuna.]
1884. *Antigonus oeclydes* Plotz, (Weym. ms.), Jahrb. Nass. Ver. Wiesbaden, XXXVII, p. 24. [Colombia.]
1888. *Aethilla echina* Staudinger, Exot. Tagf., p. 291, pl. 78.
1894. *Aethilla echina* Godman & Salvin, Biol. Cent. Amer., Rhop., II, p. 344, pl. 81, figs. 13 and 14 (♂ genitalia).
1895. *Eurypterus oeclides* Mabille & Voullet, Nov. Lep., p. 137, pl. 19, fig. 3.
1922. *Aethilla echina* Draudt, Seitz Macrolep., V, p. 876, pl. 170 c.

Echina has more or less bluish-white or gray before the outer margin of the secondaries beneath, in the form of a band, or patches, or both, but this condition varies considerably, and for that reason we have placed *oeclydes* as a synonym of *echina* as one of the many forms in which these patches are modified.

We have *echina* from Palenque and San Christobol, Chiapas, Mexico; Sinoloa, West Mexico; San Tomas, Guatemala; Hevedia, Costa Rica; Panama; Muzo, Colombia; Sapucay and S. Estanilac, Paraguay; Chapada, Matto Grosso, Brazil, and Entre Rios, Argentine.

Aethilla echina form **coracina** Butler

1870. *Aethilla coracina* Butler (*Talides coracina* Herr.-Sch. *in lit.*), Trans. Ent. Soc. London, p. 495. [Ipanema.]
1871. *Aethilla coracina* Butler, Lep. Exot., p. 66, pl. 25, fig. 8.
1882. *Aethilla primus* Plotz, Berlin Ent. Zeit., XXVI, p. 258. [Brazil.]
1907. *Aethilla primus* Godman, Ann. & Mag. Nat. Hist., (7), XX, p. 136.
1922. *Aethilla coracina* Draudt, in Seitz Macrolep., V, p. 876, pl. 170c.
1922. *Aethilla primus* Draudt, in Seitz Macrolep., V, p. 876.

Coracina is very evidently a form of *echina* Hewitson and not a distinct species. Capt. Riley has written to us that the form of the genitalia of a male specimen of *coracina* agreeing with the

Butler type does not differ from that of *echina* and this is confirmed by dissections of our own material. Although the Butler figure does not show the pale cell-end streak on the secondaries beneath, Capt. Riley informs us that it is faintly present in the type.

Plotz separated his *primus* from *coracina* by the former having the pale cell-end streak on the secondaries beneath and a hair pencil placed on the front of the hind tibiae and the latter lacking the cell-end streak and having the tibial tuft placed in back. As the cell-end streak is present in the type of *coracina* and the apparent position of the tibial tuft depends upon whether it is in the normal position or has become dislodged from it, and all of the characters given for *primus* otherwise agree with those of *coracina*, the Plotz name seems to undoubtedly be a synonym.

We have *coracina* from Villa Rica, Paraguay; St. Paulo, Brazil, and Trinidad and Beunavista (75 km. N. W. of Santa Cruz), Bolivia.

Aethilla melas Plotz

1882. *Aethilla melas* Plotz, Berlin Ent. Zeit., xxvi, p. 258. ["Rio."]
1895. *Eurypterus melas* Mabille & Vuillot, Nov. Lep., p. 137, pl. 19, fig. 2.
1907. *Aethilla melas* Godman, Ann. & Mag. Nat. Hist., (7), xx, p. 136.
1922. *Aethilla echina* form *melas* Draudt, in Seitz Macrolep., v, p. 876, pl. 170c, d.

There are no specimens before the writers which can be identified as *melas* but from the information supplied by Capt. Riley it is evident that the name applies to a distinct species and not to a form of *echina* Hew. Capt. Riley writes us that there are two specimens in the British Museum collection which he believes are the true *melas* of Plotz and which have the details of the male genitalia differing from those of *echina*. One of these specimens had been identified "at sight" by Mabille as *melas*.

On the underside of the secondaries there is a distinct, but not very strong, deep violaceous tint, and there is no trace of the bluish-grey scaling on the hind margin of the secondaries found in *echina* form *coracina*. The tibial tuft is as usual but the opening into which it projects is wider than in *coracina* and the ventral lips are bordered by blacker hairs.

In view of Capt. Riley's information *melas* should be retained for a distinct species and not for a form of *echina*.

Ocyba calathana (Hewitson)

1868. *Caecina calathana* Hewitson, Desc. Hesp., p. 56. [New Granada.]
1874. *Caecina calathana* Hewitson, Exot. But., v, text and pl. Hesp. fig. 5.
1888. *Caecina calathana* Staudinger, Exot. Tagf., p. 291, pl. 98.
1919. *Caecina calathana* Mabille & Boullet, Ann. Soc. Nat., Zool., (10), II, p. 211.
1922. *Caecina calathana* Draudt, Seitz Macrolep., v, p. 879, pl. 170g.

We have *calathana* from Colima, Mexico, Panama and Muzo, Colombia, and an intermediate form between it and *calanus* from San Christobol, Chiapas, Mexico.

Ocyba calathana form **calanus** (Godman & Salvin)

1894. *Caecina calanus* Godman & Salvin, Biol. Centr.-Amer., Rhop., II, p. 343, pl. 81, figs. 10, 11, 12, (male gen.). [Mexico; Guatemala.]
1919. *Caecina calavius* Mabille & Boullet, Ann. Soc. Nat., Zool., (10), II, p. 211.
1922. *Caecina calanus* Draudt, Seitz Macrolep., v, p. 879, pl. 173a.

Calanus appears to be a form of *calathana* in which the yellow anal angle area of the secondaries above and the yellow marginal band of those wings beneath has disappeared.

The form of the male genitalia from a typical male specimen of *calathana* from Ecuador and from another male specimen from an unknown locality which is intermediate between *calathana* and *calanus* in the extent of the yellow markings, does not differ from the figure given by Godman & Salvin for *calanus*.

Paradros atinas (Mabille) (Pl. XIX, fig. 2)

1888. *Augiades atinas* Mabille, Le Natur., (2), II, p. 146, fig. 2. [Locality ?.]

Mabille's figure is rather poor and he gives no locality for his type. There are two male specimens from the Amazonian region of Peru, in the Bell collection, which seem to be this species, one of them agreeing very well with the description and the other differing only in that the silvery spot on the underside of the secondaries is prolonged into a silvery stripe not quite reaching the costal margin and a small, narrow stripe below it, the two stripes separating the broad orange basal area from the outer purplish-brown area. The round yellow spot in the cell on the upper side of the secondaries is present in one specimen but not so prominently so as shown in the Mabille figure, in the other specimen it is very indistinct. As there seems to be a wide range of variation in the maculation, these differences do not appear important.

The uncus is rather blunt at the apex. The aedoeagus carries a number of internal spines, some of them long and heavy. The terminal arm of the claspers is long and slender, abruptly turned upward and the apex inwardly curved. There are a number of serrations beginning just before the apex on the outer edge and continuing over the entire inner edge.

Hyalothyrus mimicus Mabille & Boullet (Pl. XIX, fig. 3)

1919. *Hyalothyrus mimicus* Mabille & Boullet, Ann. Sci. Nat. Zool., (10), II, p. 245. [Peru.]

This species in both sexes greatly resembles the female of *Hyalothyrus neleus* Linnaeus but may be distinguished therefrom by the subapical spots of the primaries being in an oblique straight line and equidistant from each other; in *neleus* the lowest of these spots is placed a little outward and slightly removed from the middle spot; and in the outer hyaline spot of the two in interspace 1 being much nearer to the spot in interspace 2 than in *neleus*. On the upper side of the secondaries the white area is much narrower while beneath these wings have the entire basal two-thirds white; in *neleus* the secondaries beneath have the dark brown outer marginal border extended along the costal margin to the base and there is usually a spot of this color between veins 7 and 8 toward the outer angle although this spot is sometimes fused with the marginal band. Both sexes of *mimicus* are alike in maculation but may be separated by the males having a costal fold.

Mimicus has been omitted from Seitz Macrolepidoptera of the World.

The uncus terminates in two slender arms, slightly hooked at the apex. The scaphium is rather long. The claspers are very broad, the apical arm obliquely turned upward, at the apex an inwardly directed triangular, serrated flange, back of which, from the dorsal edge, rises a broad, slightly tapering, flange.

We have specimens of both sexes from Iquitos, Peru.

Entheus priassus (Linnaeus)

1758. *Papilio priassus* Linnaeus, Syst. Nat., (10), p. 487. ["In Indiis."]
1764. *Papilio priassus* Linnaeus, Mus. Lud. Ulric. Reg., p. 319.
1764. *Papilio talaus* Clerck, Icones, pl. 45, fig. 1.
1764. *Papilio talaus* Johanssen, Amoen. Acad., VI, p. 407.

1764. *Papilio talaus* Linnaeus, Mus. Lud. Ulric. Reg., p. 259.
1764. *Papilio peleus* Clerck, Icones, pl. 45, fig. 5.
1764. *Papilio peleus* Johanssen, Amoen. Acad., VI, p. 404.
1764. *Papilio peleus* Linnaeus, Mus. Lud. Ulric. Reg., p. 327.
1767. *Papilio priassus* Linnaeus, Syst. Nat., (12), 1, II, p. 793.
1767. *Papilio talaus* Linnaeus, Syst. Nat., (12), 1, II, p. 792.
1767. *Papilio peleus* Linnaeus, Syst. Nat., (12), 1, II, p. 792.
1782. *Papilio peleus* Cramer, Pap. Exot., III, p. 163, pl. 284, fig. F.
1782. *Papilio talaus* Cramer, Pap. Exot., IV, p. 214, pl. 393, fig. C.
1816–24. *Paramimus talaus* Hubner, Samml, Exot. Schmett., II, pl. 154, figs. 3, 4. (Not figs. 1, 2.)
1833. *Peleus aeacus* Swainson, Zool. Ill., Ins., (2), p. 75, Peleus plate, fig. 2.
1894. *Entheus priassus* Godman & Salvin, Biol. Cent.-Amer., Rhop., II, p. 354.
1897. *Entheus talaus* Mabille, Ann. Soc. Ent. France, LXVI, pp. 185, 187, 190.
1897. *Entheus peleus* Mabille, Ann. Soc. Ent. France, LXVI, pp. 187, 189, 190.
1897. *Entheus cramerianus* Mabille, Ann. Soc. Ent. France, LXVI, p. 187, [Guiana.]
1922. *Entheus priassus* Draudt, in Seitz Macrolep. V, p. 883, pl. 172e.
1922. *Entheus cramerianus* Draudt, in Seitz Macrolep. V, p. 883, pl. 172e. (Male, doubtfully the female.)
1931. *Entheus priassus* Williams & Bell, Trans. Amer. Ent. Soc., LVII, p. 260, p. 258, fig. 10, (male genitalia).

Both sexes of *priassus* are subject to considerable variation in their maculation, which accounts in part for the involved synonymy. In the males the subapical series of spots and the triangular spot in interval 3 are often, but not always, paler in color than the discal band, specimens from the Guianas usually showing the paler spots mentioned while those from the upper Amazonian region do not. In the insect figured by Cramer as *peleus* the usually wedge-shaped spot in interval 3 is reduced to an isolated, oblong spot not connected with either the discal band or the subapical spots. Godman and Salvin considered this to be merely a form of the typical insect and are apparently correct as there are occasional specimens which show the reduction of this spot between the typical insect and Cramer's figure. In addition both fly together in French Guiana and present no difference in the form of the male genitalia.

Clerck's figure of *talaus* undoubtedly represents the female of his *peleus* which we believe to be the insect described as *priassus* by Linnaeus. Cramer's figure of *talaus* represents the same insect as that of Clerck. As shown in both the Clerck and Cramer figures the white discal area of the secondaries is small and

extends only to the inner edge of the abdominal fold, not crossing it to the inner margin of the wing. This character is, however, variable and in some individuals the white area entirely crosses the abdominal fold to the inner margin of the wing.

Hubner's figures 3 and 4 evidently pertain to the female of *priassus* but his figures 1 and 2 appear to represent that sex of *gentius* Cramer.

Godman & Salvin placed *priassus* as a synonym of *peleus* but the former name has several years priority over the latter. The name *priassus* was for some reason omitted from the papers by Mabille and Mabille & Boullet.

Mabille applied the name *cramerianus* to the figure given by Cramer for *talaus* but as noted above Cramer's *talaus* is the same as that of Clerck and evidently the female of *priassus*, to which name *cramerianus* falls as a synonym.

There are slight variations found in the termination of the claspers in the male genitalia but these cannot be definitely connected with any of the variations in maculation and they are taken to be merely individual and not of specific character.

Entheus telemus Mabille (Pl. XIX, fig. 4)

1897. *Entheus telemus* Mabille, (Plotz ms.), Ann. Soc. Ent. France, LXVI, p. 190. [Brazil.]

1919 (1918). *Entheus telemus* Mabille & Boullet, (Plotz fig. 1137, non descript. ?), Ann. Soc. Nat. Zool., (10), II, p. 257.

This insect is closely allied to *priassus* Linnaeus but differs constantly in the form of the male genitalia in the shape of the uncus and the termination of the claspers.

The subapical spots of the primaries are joined along the costal margin with the discal band and at the lower end of the series with the triangular spot in interval 3, thus forming a small triangular black spot entirely surrounded by the orange spots. All of the orange spots are of the same color.

In the male genitalia the uncus terminates in two short but very pronounced arms, whereas in *priassus* the uncus is broad at the apex with but a very slight projection at each corner. In the termination of the claspers the difference between the two species is not always so pronounced in all cases, but the termination is usually broader and more rounded in *telemus* and lacks the slight ventral flange at the apex, or tendency to one, found in *priassus*.

There is a series of *telemus* in the collection of the Academy of Natural Sciences from Manicore, Rio Madeira, Brazil.

Celaenorrhinus shema (Hewitson) (Pl. XIX, fig. 5)

1877. *Pterygospidea shema* Hewitson, Ann. & Mag. Nat. Hist., (4), xx, p. 322. [Cayenne and Calabar.]

1882. *Plesioneura ochrogutta* Moschler, Verh. k.-k. zool.-bot. Ges. Wien, xxxii, p. 330, pl. 17, fig. 22. [Surinam.]

1922. *Celaenorrhinus eligius songoensis* and *shema* (?) Draudt, in Seitz Macrolep., v, p. 885, pl. 173b. [Rio Songo, Bolivia.]

Hewitson's name should be restricted to this species as the description was taken from the Cayenne material, the Calabar specimens were mentioned as differing in certain characters. The insect is smaller and the discal spots of the primaries are smaller and placed further apart than in *eligius* Cramer. The lower of the subapical spots extends a little outward of the other two, the usual spot in cell 1 toward the base is absent in most of the specimens at hand but very minutely present in some; the costal spot of the discal band is also very small. The apex of the primaries is rounded.

In the series present there are specimens from French Guiana, Peru and Bolivia and these show a considerable variation in the distinctness of the spots on the under side of the secondaries but all are more orange-yellow than in *eligius*. In two specimens from Peru, one of each sex, the under side of the secondaries, including the cell and below vein 6 is entirely yellow with the exception of a small accumulation of dark brownish scales near the anal angle, the basal area above the cell heavily overscaled with yellow, thus leaving only the outer angle area and half the costal margin of the usual dark brown ground color, in which there is one yellow dot above vein 6 and two above vein 7.

Moschler's description of *ochrogutta* accurately describes the species but his figure is very poor and omits details mentioned in the description. A Bolivian specimen agreeing with the Draudt figure of *songoensis* does not differ in the form of the male genitalia from French Guiana specimens.

The form of the male genitalia is somewhat similar to that of *eligius* but constantly differs in small details.

The Draudt figure of *shema* seems to be intended for the species but it is too dark and the spots, especially the subapicals, are not

accurately placed; the marginal row shown on the primaries is present in some of our specimens, but as rather ill-defined yellowish dots, not white, and those of the secondaries are shown in our specimens but are also yellowish and not white.

Celaenorrhinus punctiger (Burmeister) (Pl. XIX, fig. 6)

1878. *Eudamus punctiger* Burmeister, Desc. phys. Rep. Argentina, v, p. 292, Atlas plate, 9, fig. 12. [Argentina.]

1933. *Celaenorrhinus eligius* Hayward, Rev. Soc. Ent. Argentina, v, p. 224, pl. 24, fig. 1. (Not pl. 19, fig. 1, male genitalia.)

Punctiger is larger than usually found in *eligius* and as a rule lacks the two white hyaline spots in interspaces 4 and 5 below the three subapical spots but in occasional females one or both of these spots are minutely present and this is also true of the small spot in interspace 1. Sometimes there is a hazy submarginal greyish line on the primaries with an accumulation of greyish scales between it and the margin of those wings. The head and tegulae are more distinctly tinted with green than in *eligius*.

The secondaries above vary in the distinctness of the cell spot and the discal band of pale spots but they are never very prominent and occasionally almost lacking. Beneath these spots vary in the same manner.

The species attains a large size, males in the series at hand expanding from 52 to 60 mm. and the females from 58 to 62 mm.

The form of the male genitalia, while somewhat similar to that of *eligius* materially and constantly differs from that species.

There are specimens before the writers from Itatiaya Mts., Rio Janeiro; Hansa Humboldt; Massaranduba; Blumenau, Brazil; Entre Rios, Argentine.

Celaenorrhinus similis Hayward (Pl. XIX, fig. 7)

1933. *Celaenorrhinus similis* Hayward, Rev. Soc. Ent. Argentina, v, p. 225, pl. 24, fig. 2 and pl. 19, fig. 3, (male genitalia). [Missiones, Argentine.]

This species differs from *eligius* Cramer in the male genitalia, and may be distinguished as follows. It is somewhat smaller, the three hyaline apical spots are larger, the spots of the discal band are more irregular in shape and the third spot is more removed outwardly, on the lower wing the yellow-white spots are more prominent both above and below, the outer margin is more angular and the anal fold is more prominently gray.

As Mr. Hayward's figure of the male genitalia is not complete we are figuring it again. The uncus terminates in two smooth diverging arms, the clasps end in two separate flanges with upturned pointed ends, a shorter one overlapping a longer, more slender one, this condition not being very clear in the Hayward figure. There is a toothed projection extending from the costal portion.

We have *similis* in the Academy collection from Villa Rica and Sapucay, Paraguay, and Chapada, Matto Grosso, Brazil.

Celaenorrhinus cynapes Hewitson (Pl. XIX, fig. 8)

1870. *Celaenorrhinus cynapes* Hewitson, Equat. Lep. p. 74. [Ecuador.]

We have a specimen from Ecuador which we determine as the Hewitson species. It differs from *eligius* Cramer in that the discal band is straight across the wing, not broken, only separated by the veins, the four usual spots lustrous and the fifth extra discal one in line with and impinging the others, not removed as in the allied species.

Wings uniformly dark brown with very little indication of the usual spots of the secondaries, below, yellow scale dustings toward the base and a yellow patch at the end of the band at the anal angle of the primaries.

The male genitalia are similar to those of *eligius* differing principally in the form of the termination of the clasp.

Quadrus cerialis (Cramer)

1782. *Papilio cerialis* Cramer, Pap. Exot., IV, p. 213, pl. 392, figs. N, O. [Surinam.]
1793. *Hesperia orcus* Fabricius, Ent. Syst., (3), I, p. 341. ["In Indiis."]
1800. *Papilio orcus* Donovan, Ins. India, pl. 52, fig. 1.
1826–41. *Pythonides orcus* Hubner, Samml. Exot. Schmett., III, pl. 33, figs. 3, 4 (not 1 and 2).
1871. *Pythonides cerberus* (Hubner, Verz. bek. Schmett., p. 111, 1820) Kirby, Cat. Diurn. Lep., p. 627.
1894. *Pythonides cerialis* Godman & Salvin, Biol. Centr.-Amer., Rhop., II, p. 358, pl. 82, fig. 2 (male genitalia).
1922. *Pythonides cerialis* form *majorinus* Draudt, in Seitz Macrolep., V, p. 886, pl. 173c. [Bolivia.]

Cramer's figure of *cerialis* and Hubner's figure of *orcus* both show an insect as large as, if not larger, than Draudt's figure of his form *majorinus*, which was so named on account of its large

size and more profuse blue maculation. A series of Bolivian specimens shows the size no greater and the blue maculation no more pronounced than found in many other localities. While small individuals of *cerialis* naturally occur it is probable that many of them so identified in collections are in reality the northern form of *u-lucida* Plotz which has a very similar form of maculation.

Quadrus u-lucida (Plotz) (Pl. XIX, fig. 9)

1884. *Pythonides u-lucida* Plotz, Jahrb. d. Nass. Ver. f. Nat., xxxvii, p. 6. [Colombia.]

1916. *Pythonides mimus* Mabille & Boullet, Bull. Soc. Ent. France, 1916, p. 321. [Brazil; Paraguay; Rio Grande do Sul.]

1922. *Pythonides u-lucida* Draudt, in Seitz Macrolep., v, p. 888, pl. 173g.

1933. *Pythonides u-lucida* Hayward, Rev. Soc. Ent. Argentina, v, p. 227, pl. 24, fig. 4, pl. 19, fig. 5 (male genitalia).

Plotz placed his *u-lucida* as a synonym of *cobarus* Moschler but the description he gave does not agree with Moschler's description of *cobarus*. *Cobarus* Moschler is probably a synonym of *Quadrus lugubris* Felder as heretofore placed by authors.

The insect agreeing with the Plotz description is before the writers from Paraguay and has four subapical spots on the primaries and the greater part of the secondaries beneath whitish or bluish-white with several dark spots in the upper part of the wings. The Hayward figure accurately portrays the species; the Draudt figure shows but two subapical spots on the primaries, which may be merely a variation.

The species apparently has a wide geographical range, and the more northern individuals which do not differ in form of male genitalia, differ from the typical insect in maculation in having but three subapical spots, lacking the costal spot shown in the Hayward figure (which is also the upper one shown in the Draudt figure). The middle one of the three spots is placed a little inwardly, thus forming a triangle. Beneath the secondaries are blue, not whitish or bluish-white, with the same dark spots of the typical form. The amount of blue on these wings varies individually as it does in other species. The U-shaped spot in the cell of the primaries often (but not always) has the lower side broken, leaving the outer end as a separate dot.

U-lucida is a smaller species than *cerialis* but is practically indistinguishable in the northern form from such small individuals of *cerialis* as occasionally occur.

The uncus is much more slender and the scaphium longer in proportion than in *cerialis*, which is not accurately shown in the Hayward figure of the genitalia, which also shows a spine-like projection from the end of the clasper which is really nothing but a tuft of stiff hairs and not a chitinous part.

In the series of specimens at hand there are individuals of the typical insect from Paraguay and of the northern form from Obidos, Brazil; Peru; Bolivia; Trinidad, British West Indies; Nicaragua.

Quadrus portulana (Plotz)

1884. *Pythonides portulana* Plotz, Jahrb. d. nass. Ver. f. Nat., xxxvii, p. 8. [South America.]
1907. *Pythonides portulana* Godman, Ann. & Mag. Nat. Hist., (7), xx, p. 154.
1922. *Pythonides cordus* Draudt (not Mabille), in Seitz Macrolep., v, p. 886, pl. 173c.

Portulana is specifically quite distinct from *festiva* Erichson and Godman evidently misidentified the latter species when he placed *portulana* as a synonym of it. The original descriptions of the two do not coincide and Capt Riley informs us that the specimen in the British Museum which Godman compared with the Plotz figure of *portulana* does not agree with the Erichson description of *festiva* and is the insect usually passing in collections as *festiva*.

The insect figured by Draudt as *cordus* appears to represent *portulana*, it certainly does not agree with the Mabille description of *cordus*. Plotz mentions but one spot in the cell, in the upper part, but this seems to be a variable character and there are usually two spots in the cell, one above the other.

The arrangement of the blue or greenish bands on the secondaries is quite similar in both *festiva* and *portulana* but in the former the upper band is shorter, not reaching the outer margin of the wing, and the lower band is narrower and more zig-zag in shape, and its lower side is well removed from the margin of the wing. The primaries of *festiva* are quite different from those of *portulana*, being heavily overscaled with blue or greenish, there is a single, prominent, triangular spot in the cell and the lower

spot of the discal band is produced into a long point on both veins 2 and 3, in *portulana* there is no overscaling and the lower spot mentioned has straight sides.

The male has two pairs of spurs on the hind tibiae and no tuft.

Paches festiva (Erichson)

1848. *Syrichthus festiva* Erichson, Schomb. Reise in British Guiana, III, p. 604. [British Guiana.]
1868. *Leucochitonea lucullea* Hewitson, Descr. One Hundred New Spec. Hesp., (2), p. 46. [Ega, Amazon.]
1869. *Leucochitonea lucullea* Hewitson, Exot. Butt., IV, Leucochitonea pl., figs. 9, 10.
1884. *Pythonides festiva* Plotz, Jahrb. d. nass. Ver. f. Nat., XXXVII, pp. 7, 8.
1922. *Pythonides festivus* Draudt, in Seitz Macrolep., V, p. 888, pl. 173f. [Locality ?.]
1922. *Pythonides lucullea* Draudt, in Seitz Macrolep., V, p. 888, pl. 173 f.

Considerable confusion seems to have occurred in the identification of this species although the description of it is quite clear in detail. The writers agree with Plotz in placing *lucullea* Hewitson as a synonym of *festiva* Erichson, as the descriptions of the two insects and the Hewitson figure indicate that they are the same.

It is very doubtful that the Draudt figure of "*festivus*" refers to this insect, if it does it is extremely poor.

The males of *festiva* possess two pairs of spurs on the hind tibiae and in addition have a tibial tuft, characters used by Godman & Salvin in separating their genus *Paches* from *Quadrus* (*Pythonides auct.* not Hubner) which has the two pairs of spurs but lacks the tibial tuft.

There is a series of *festiva* in the Academy collection from Manicore, Rio Madeira, Brazil.

Paches loxus form **gladiatus** (Butler)

1870. *Pithonides gladiatus* Butler, Trans. Ent. Soc. London, p. 572. [Para: Tapajos.]
1874. *Pithonides gladiatus* Butler, Lep. Exot., p. 189, pl. 64, fig. 6.
1922. *Paches gladiatus* Draudt, in Seitz Macrolep., V, p. 889, pl. 173i.
1925. *Paches radiatus* Lindsey, (Butler), Dennison Univ. Bull., XXI, p. 84. (In error for *gladiatus*.)

Gladiatus is a form of the male of *loxus* Westwood, in which the blue area of the secondaries above is divided across its center, parallel with the outer margin, by a band of the ground color.

An examination of the male genitalia shows them to be identical with those of *loxus*.

There are specimens of *gladiatus* in the Academy collection from Para, Brazil, and Iquitos and Tarapota, Peru.

Pythonides herennius Hubner

1826–41. *Pythonides herennius* Hubner, Samml. Exot. Schmett., III, pl. 34, Figs. 1, 2, 3, 4. [Brazil.]
1868. *Leucochitonea lagia* Hewitson, Descr. 100 New Spec. Hesp., (2), p. 47.
1922. *Ate lagia* Draudt, in Seitz Macrolep., v, p. 888, pl. 173g.

Hewitson proposed the name *lagia* to replace *herennius* Hubner because the name had previously been used by Cramer for another Hesperid but the Cramer species, described as *Papilio herennius*, is a member of the genus *Cyclosemia* and therefore Hubner's name is perfectly valid and Hewitson's name must fall as a synonym.

The form of the male genitalia is the same as that of *proxenus* Godman & Salvin as figured by them in the Biologia (Pl. 85, fig. 33), and that insect is undoubtedly the northern race of *herennius*.

Wallengrenia premnas (Wallengren)

1860. *Hesperia premnas* Wallengren, Wien Ent. Mon., IV, p. 38. [Buenos-Ayres.]
1861. *Hesperia premnas* Wallengren, Fred. Eugenie Resa Ins., Lep., p. 358.
1878. *Hesperia physoptila* Burmeister, Desc. Phys. Rep. Argentina, Lep., v, p. 250. (Atlas, Add. & Corr., p. 56, 1880.)
1883. *Hesperia pudorina* Plotz (H. S. ms.), Ent. Zeit. Stettin, XLIV, p. 55. [Brazil.]
1897. *Wallengrenia premnas* Berg, Ann. Mus. Nat. Buenos Aires, (2), v, p. 255.
1902. *Catia minaya* Schaus, Proc. U. S. Nat. Mus., XXIV, p. 466. [Tijuca, Brazil.]
1922. *Catia pudorina* Draudt, Seitz Macrolep., v, p. 933, pl. 181e.

Berg (1897) called attention to the identity of *premnas* and *physoptila* and erected the genus *Wallengrenia* for *premnas* based on the peculiar stigma of the male, consisting of two spots "one discoidal, elongate, directly below the median vein, the other, punctiform, somewhat before the middle in the cell between veins 1 and 2". This is characteristic of the genus *Catia* Godman & Salvin erected three years later (1900) with *Hesperia drury* Latreille (*otho* Smith & Abbot) as the genotype.

Premnas has been misidentified or confused in most collections but the original description calls for the unusual form of the stigma, and the balance of the description agrees with that of *pudorina*, a rather common and widely distributed species in South America.

Lindsey's *Chaerephon pudorina* [1] is a misidentification. It is *Chaerephon vesana* Weeks, but was based on material so identified in the collection of the U. S. National Museum, and this accounts for the subsequent naming of premnas as *minaya* by Dr. Schaus. The genus *Catia* must fall to *Wallengrenia* with *premnas* as the type, congeneric with *otho*.

There are series of *premnas* in the Academy collection from Entre Rios, Argentine; Santa Catharina, Brazil; Villa Rica and Sapucay, Paraguay; Beunavista and Coroico, Bolivia; Bartica and Warani, British Guiana.

Vinius tryhana (Kaye) (Pl. XIX, fig. 10)

1914. *Padraona tryhana* Kaye, Trans. Ent. Soc. London, p. 581, pl. 30, fig. 3, (1913). [Trinidad, British West Indies.]

1919. *Padraona sophistes* Dyar, Proc. U. S. Nat. Mus., LIV, p. 340. [Mexico.]

Specimens of *tryhana*, collected by Mr. A. S. Pincus, in several Trinidad localities, show the usual stigma on the primaries and hair-tuft in the abdominal fold of the secondaries of the males which characterize that sex of this genus.

The species has an extended geographical range, there being specimens in the series at hand from Colombia; French Guiana and southern Brazil in addition to those from Trinidad. A Colombian male compared with the type of *sophistes* Dyar agrees with it in all superficial characters and it would therefore seem that the species extends as far north as Mexico.

A pair taken in copulation show the female to be very similar to the male in maculation, the secondaries are somewhat more rounded and, of course, the stigma and hair-tuft are lacking in this sex.

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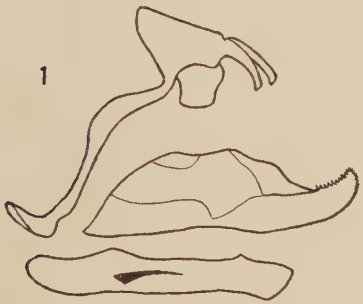
[1] Dennison Univ. Bull., XXI, p. 92, pl. 26, fig. 10, pl. 30, fig. 11 (male genitalia), 1925.

Explanation of Plate XIX

Male Genitalia

Fig. 1.—*Achalarus toxeus* (Plotz) Mexico.
Fig. 2.—*Paradros atinas* (Mabille). Peru.
Fig. 3.—*Hyalothyrus mimicus* Mabille and Boullet. Peru.
Fig. 4.—*Entheus telemus* Mabille. Manicore, Brazil.
Fig. 5.—*Celaenorrhius shema* (Hewitson). French Guiana.
Fig. 6.—*Celaenorrhinus punctiger* (Burmeister). South Brazil.
Fig. 7.—*Celaenorrhinus similis* Hayward. Villa Rica, Paraguay.
Fig. 8.—*Celaenorrhinus cynapes* Hewitson. Ecuador.
Fig. 9.—*Quadrus u-lucida* (Plotz). Villa Rica, Paraguay.
Fig. 10.—*Vinius tyrhana* (Kaye). Trinidad.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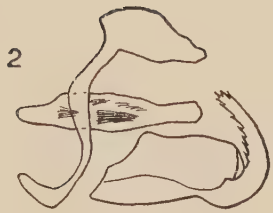
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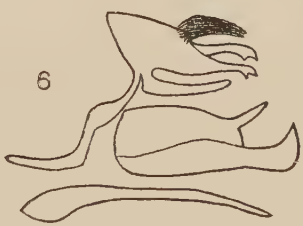
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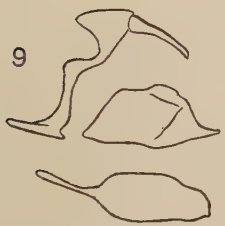
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STUDIES IN ORTHOPTERA WHICH OCCUR IN NORTH AMERICA NORTH OF THE MEXICAN BOUNDARY

BY MORGAN HEBARD

(Plate XX)

IV. SYNONYMY AND A NEW SPECIES OF THE GENUS DIAPHEROMERA, (PHASMIDAE, HETERONEMIINAE)

DIAPHEROMERA Gray

In 1909 Rehn and Hebard erected the subgenus *Ceratites* to include their species *covilleae*, distinguished from *Diapheromera* by having two occipital horns, and that year Rehn added *tamaulipensis* from northeastern Mexico. In 1912, finding that the generic name *Ceratites* was preoccupied, Rehn and Hebard proposed *Rhabdoceratites*. Seventeen years later Strand proposed *Ceratita* [1] not realizing that Rehn and Hebard had renamed their *Ceratites*, thus adding another name to this synonymy. The author recognized this entity as of generic rank in 1932 and added the Mexican *beckeri* (Kaup), 1871.

Study of the available series and the new species described below shows that decided variation in the occipital horns occurs, while the male type of *tamaulipensis* lacks these and it is quite possible that they are regularly absent in that sex of that species. Further characters of generic value apparently do not exist and we believe that it is best to place *Rhabdoceratites* as a synonym of *Diapheromera*, though the species there assigned form a group well distinguished from any of those to which the species of the eastern half of the United States belong.

Diapheromera torquata new species (Pl. XX, figs. 1, 2, 3)

This is a small and graceful species apparently peculiar to the Chisos Mountains in the Big Bend region of the Rio Grande in western Texas. Nearest relationship is to *D. erythropleura*

[1] Arch. Naturgesch., **92**, p. 46, (1926).

Hebard from the state of Sinaloa, Mexico. Males are quickly distinguished by the unusual position of the poculum, which is twisted into an almost vertical position, protecting the concealed genitalia dextrad, while other plates are produced to protect them over the remaining area. Moreover the simple male cerci are distinguished by having no specialization whatever proximo-internally, in this feature agreeing only with *erythropleura* of the previously described species.

A half grown female shows two very small angular projections on the head slightly above and back of the eyes which are definitely longitudinal. Half grown male immatures of this insect and of *tamaulipensis* [2] are difficult to distinguish agreeing in the absence of occipital horns and in general proportions, the poculum in this stage of *torquata* being in normal ventral position but projecting to beyond a median point on the ninth tergite, whereas in *tamaulipensis* it only slightly surpasses the intersection of the eighth and ninth tergites.

Type.—♂; Lost Mine Peak, Chisos Mountains, Texas, at 5800 feet. September 6, 1912. (Rehn and Hebard). [Hebard Collection, Type No. 1245].

Size small, form decidedly slender for the genus. Surface smooth and shining. Head no longer than pronotum but considerably longer than wide, lacking occipital horns. Seventh tergite moderately enlarged in distal two-thirds, its disto-ventral angles produced, acute angulate, its dorsal length distinctly less than the combined length of the eighth and ninth tergites. Eighth tergite transverse, about half as long as ninth. Ninth (ultimate) tergite strongly convex dorsad, widening slightly to a subapical point and there as wide as long, caudal margin in dorso-caudal aspect broadly rounded rectangulate emarginate, leaving the apex of the minute supra-anal plate exposed. Cerci simple, unarmed, moderately elongate, curving moderately inward, with internal surface flattened and apex rounded. Poculum springing from eighth sternite dextrad, small, rounded spoon-shaped, twisted into an almost vertical dextral position; eighth sternite produced in two rounded adjacent elongate plates the convex surfaces of which conceal the genitalia ventro-sinistrad, sinistrad and sinistro-dorsad and act as a convex lid to the poculum. Cephalic femur slightly longer than combined length of

[2] Immature material representing both sexes of *tamaulipensis* from Sanderson, Texas, is before us.

head, pronotum and mesonotum. Median femur much heavier but not enlarged to the degree usual in males of most of the other species of the genus. Median femur with a large sigmoid distal spine of the medio-longitudinal ventral carina,[3] beneath which this carina shows a decided convex elevation. Caudal femur similarly but less strongly specialized. Median tibia with medio-longitudinal carina of ventral surface with minute denticles, this and the lateral carinae each terminated distad in a tuft of spiniform hairs; caudal tibia similar but with denticulations very small and weak.

In the immature females discussed above the limbs are shorter, the median femora not enlarged, the femoral spine very small and the tibiae have no denticulation. The seventh tergite is slightly longer than the ninth, the eighth tergite slightly longer than broad and distinctly longer than the short, straight cerci. In the adult female these proportions may show some difference.

Head brownish ochraceous-buff, occiput with a very broad weak longitudinal band of saccardos umber and moderately broad postocular bands of the same. Pronotum brownish ochraceous-buff with a medio-longitudinal band of verona brown. Mesothorax, metathorax, abdomen to apical portion and limbs shining cinnamon brown (more reddish); lateral margins of mesonotum and metanotum dull light ochraceous tawny; distal portion of abdomen clay color. Antennae clay color tinged with olivaceous.

The immatures are all light green, apparently uniformly colored in life.

The measurements of the extremes are here given for the adult males. Length of body 51.3 to 55.4, length of mesonotum 12.3 to 14.2, median width of mesonotum 1.2 to 1.2, length of metanotum (including median segment) 11.7 to 12.3, length of median segment 1.8 to 1.8, dorsal length of seventh tergite 2 to 2, length of cephalic femur 16.7 to 18, length of caudal femur 17.3 to 19 mm.

Specimens Examined: 10; 5 males and 5 immature individuals.

TEXAS: Canyon behind Pulliam Bluff, Chisos Mountains, 4600 to 5000 feet, IX, 7, 1912, (Rehn and Hebard; on low Acacia among weeds and in shrubbery, Zone of Oaks), 1 ♂ *paratype*, 3 juv. ♂, 2 juv. ♀. Lost Mine Peak, Chisos Mountains, 5800 feet, IX, 6, 1912, (Rehn and Hebard; on slopes covered with high grass and much oak brush), 4 ♂, *type* and *paratypes*.

[3] Similar in *erythropleura*. Though the tooth rests inside the tibia when the limbs are folded it does not spring from the ventro-internal margin in either species, though such was incorrectly stated in the description of that species.

V. THE PACHYMORPHINAE OF THE UNITED STATES (PHASMIDAE)

PARABACILLUS Caudell

1903. *Parabacillus* Caudell, Proc. U. S. Nat. Mus., xxvi, p. 865.

Monotypic genotype: *Parabacillus coloradus* (Scudder).

In 1893 [4] Scudder very briefly described two species which he referred to *Bacillus*. Both were represented by females only; the first, *coloradus*, from an elevation of 5500 in Colorado, the second, *carinatus*, from "Arizona" and "Mexico." Caudell described a third species, *Bacillus palmeri*,[5] based on a female from Durango, Mexico, in 1902. In his revision of the Phasmidae of the United States in 1903 he considered that only a single species, subject to considerable individual variation was present in this country, *carinatus* for some time having been placed as a synonym of *coloradus*.

Very large series now before us show beyond question the presence in the United States of two species, very similar in the females but easily distinguished in the males. Both species lack the sparse and fine tuberculation of the body described by Scudder for his *carinatus*, but Mexican females before us [6] all show that feature. As a result we can not help believing that the specimen of *carinatus* labelled "Arizona" actually came from Mexico.

Three species are here distinguished, as follows:

A. Female (male unknown) with dorsal surface of body sparsely and finely tuberculate. Mesosternum and metasternum with a decided medio-longitudinal carina except at their lobes. Penultimate (ninth) abdominal tergite (preceding supra-anal plate) nearly one and one-half times as long as the preceding (eighth) tergite. Jalisco, Mexico.
Parabacillus carinatus (Scudder)

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[4] Psyche, vi, p. 372.

[5] Ent. News, xiii, p. 274.

[6] Guadalajara, Jalisco, vii, 16 and 22, 1903, (J. F. McClendon), 3 ♀, recorded by Rehn as *palmeri*, Proc. Acad. Nat. Sci. Phila., 1904, p. 516. Zapotlanejo, Jalisco, VII, 31, 1903, (J. F. McClendon), 1 ♀.

AA. Both sexes with dorsal surface of body entirely lacking tuberculation.[7] Female mesosternum and metasternum with a weak medio-longitudinal carina cephalad which soon becomes obsolete. Female penultimate (ninth) abdominal tergite (preceding supra-anal plate) normally proportionately shorter, one and one-quarter times to only slightly longer than the preceding (eighth) tergite.

B. Male with penultimate (ninth) abdominal tergite no longer than its greatest width. Poculum with suture between eighth and ninth sternites (which form it) distinct, apex reaching base of cerci and convex, not emarginate. Southern Utah, Nevada, all but extreme eastern and the Plateau of Arizona, Oregon and California.

Parabacillus hesperus new species

BB. Male with penultimate (ninth) abdominal tergite fully twice as long as its greatest width. Poculum with suture between eighth and ninth sternites (which form it) obsolete apex reaching only opposite base of ninth tergite and strongly emarginate. Southwestern South Dakota, western Nebraska, Kansas, Oklahoma and Texas, southeastern Wyoming, all of Colorado and New Mexico and eastern Utah and the Plateau of and extreme eastern Arizona.

Parabacillus coloradus (Scudder)

In considering *carinatus* we believe, from the large Arizonan series before us in which not a single case of general dorsal tuberculation is shown, that Scudder's "Arizona" female was probably incorrectly labelled and that it, like the other female upon which that name was based, probably came from Mexico. We therefore here select as type of *carinatus* the female labelled "Mexico" in the collection of the Museum of Comparative Zoology.

The proper association of Caudell's *palmeri*, based on a female from Durango, Mexico, can not be made with any certainty until more material, and particularly males, can be studied. Caudell writes that it is not tuberculate and so it may represent one of the species occurring in the United States. If that is the case it is more likely to prove to be a synonym of *coloradus*, as the penultimate (ninth) abdominal tergite measures 2 mm. and the eighth tergite 1⅓ mm. The elongate limbs given by Caudell

[7] Very rarely a female occurs with very feeble tuberculation indicated on the cephalic portion of the mesonotum only (one- Clovis, New Mexico; one- Paradise, Arizona).

as the major feature to distinguish *palmeri* from *coloradus* are shown by our series to have no diagnostic value whatever in the genus.

In the United States the males of the two species which occur there are easily separated and this is usually true for females where both sexes occur. In the north, however, where parthenogenesis is universal in both, it is a difficult problem to determine where the eastern species finds its western limits and the western species takes its place. This is particularly true for the Arizona Plateau where the mingling of Great Plains and western species is so decided that we assign our material from that region to *coloradus* with considerable uncertainty.

Parabacillus hesperus new species (Pl. XX, figs. 5, 6)

This interesting new species has been consistently confused in past literature with *P. coloradus* (Scudder), all previous records of *coloradus* from Arizona, Oregon and California being referable to *hesperus*.

As noted above males are easily separated by the penultimate tergite and poculum, but females are much more difficult to distinguish, having in *hesperus* the ninth tergite as a rule only slightly longer than the eighth but this feature being subject to individual variation in both species.

The present insect is known north to the Wah Wah Range, Utah; Caliente, Nevada, and the Steens Mountains and Boardman, Oregon; west to the Pacific (but absent over most of the area west of the Sierras); south to the Mexican boundary, and east to the Huachuca Mountains, Arizona, and Leeds and Bellevue, Utah.

Type.—♂; south slopes of Atascosa Peak, Pajaritos Mountains, Arizona. Elevation 5500 to 6100 feet. September 21 and 22, 1924. (Rehn and Hebard). [Hebard Collection, Type No. 1259].

A medium small and extremely slender walking-stick. Antennae short, less than three times length of the elongate head. Surface smooth, without tubercles, a prominent medio-longitudinal carina on mesonotum and metanotum and with coarse low sub-marginal longitudinal carinae on each side; mesosternum and metasternum with a medio-longitudinal carina indicated

only very briefly at cephalic end. Median segment symmetrically trapezoidal, as long as proximal width, greatest width caudad. Ninth (penultimate) tergite only very slightly longer than wide, with a fine medio-longitudinal carina, its surfaces laterad convex. Supra-anal plate not visible from above. Cercus incurved, apex rounded, a rounded lobe proximo-internally with surface facing mesad flat and apposed to the corresponding surface of the opposite cercal lobe. Poculum elongate, convex, formed by the eighth and ninth sternites, suture between these sternites distinct, apical portion narrowing to the broadly rounded apex which reaches as far as the base of the cerci. Limbs very slender, unarmed; femora with genicular lobes angulate.

Allotype.— ♀ ; same data as type but taken September 21, 1922. [Hebard Collection].

Considerably longer than male and more robust, though exceedingly attenuate. Antennae proportionately shorter, only a little longer than head. Body smooth, without tubercles, carinae similar but traces of lateral carinae proximad on mesosternum and metasternum, abdomen showing traces of a number of longitudinal carinae. Median segment markedly broader than long. Seventh tergite slightly shorter than combined length of eighth and ninth, eighth tergite very slightly shorter than ninth. Supra-anal plate very small, triangular, with a medio-longitudinal carina. Cerci straight, elongate, distinctly longer than ninth tergite. Operculum moderately elongate, flattened, with triangular apex, beyond which the exposed ovipositor valves reach to the base of the cerci.

Individuals are as a rule straw color, but some specimens vary from light red brown (rare) to mummy brown (frequent only in rare series). A striking broad medio-longitudinal band of brown is present on head and thorax but becomes weaker on the abdomen in most of the males, this being obsolete or weak on the abdomen in most females. A narrow post-ocular band of brown is usually present on the head, being decided in intensive specimens, but often well defined even in extremely recessive individuals.

The size variation is great, as shown by the following measurements (in millimeters).

	Length of body	Length of mesonotum	Length of cephalic femur	Length of ninth tergite
♂				
Carr Canyon, Huachuca Mts., Arizona	50.5	11.4	22.2	1.13
Lower Madera Canyon, Santa Rita Mts., Arizona	52.8–54.8	12.7–13	23.8–25.6	1.2 –1.23
South slope Atascosa Peak, Arizona	50.7–53.8	12. –12.8	24.7–26	1.2 –1.3
Ajo, Arizona	46.8	10.6	22.7	1.23
Goffs, California	46.3–52.8	11.3–11.8	20.3–25	1.27–1.34
Cactus Flat, San Bernardino Mts., California	41.	9.	16.6	1.06
♀				
Bellevue, Utah	50.7	11.	17.2	1.06
Lee Canyon, Spring Mts., Nevada	56.3	12	19.7	1.3
Lower Madera Canyon, Santa Rita Mts., Arizona	68.7	14.4	24.4	1.34
South slope Atascosa Peak, Arizona	74.3–80	16.4–17.2	27.7–27.8	1.4 –1.5
Sycamore Canyon, Baboquivari Mts., Arizona	66.7–78.2	15.7–16.3	24.5–28.2	1.5 –1.63
Dewey, Arizona	47.7	10.3	17.9	1.42
Goffs, California	61.4	13.2	21.3	1.56
Paradise Valley, Tehachapi Mts., California	50.7	10.6	16.7	1.25
Descanso, California	60.7	12.8	21.8	1.42

A warmer environment clearly brings about greater size and attenuation in this species. No males are known from northern Arizona, Utah, Nevada, Oregon, or north of Goffs in California. The insect is evidently parthenogenetic in the northern portions of its range. We have already noted the difficulty in determining the eastern limits of *hesperus* in that region.

Specimens Examined: 151; 37 males, 79 females and 35 immature individuals.

Utah: One and a half miles north of Bellevue, 4100 feet, IX, 11, 1926, (Rehn; beaten from yellow grass), 2 ♀. One mile south of Leeds, 3600 feet, IX, 6, 1926, (Hebard; beaten from composite, "Rabbit Brush"), 2 ♀. Pink sand hills between Three Lakes and Virgin River, 5750 feet, IX, 1, 1926, (Rehn; beating), 1 ♀. Base of Hurricane ledge above Hurricane, 3700 feet, IX, 4, 1926, (Hebard; resting sprawled out on top of a small composite, "Rabbit Weed"), 1 ♀. Road summit, Wah Wah Range, 6600 feet, VIII, 24, 1926, (Rehn; in fine dry grasses), 1 ♀. Road pass, Beaver Dam Mountains, VII, 31, 1930, (E. R. Tinkham), 1 juv. ♀.

Nevada: Caliente, 5200 feet, IX, 3, 1909, (Rehn and Hebard; in dry grasses on mountain side), 1 teneral ♀. Lee Canyon, Spring Mountain Range, 4000 feet, VIII, 18 and 22, 1919, (Rehn and Hebard; occasional in tufts of slender yellow grass, zone of Tree Yucca), 3 ♀ (one teneral), 9 large juv. ♀.

Arizona: Rock House Canyon, Dos Cabezos Mountains, 4300 feet, X, 14, 1910, (Rehn and Hebard; in bunch grass among *Dasylirion* and junipers), 1 ♂. Carr Canyon, Huachuca Mountains, IX, 23 and X, 8, 1904, (C. R. Biederman), 1 ♂, 1 ♀, recorded by Rehn as *coloradus*. Huachuca Mountains, VIII, 1, 1927, (R. H. Beamer), 1 ♂, [Univ. of Kansas]. Elgin, IX, 1, 1927, (J. C. Bradley), 1 juv. ♀, [Cornell Univ.]. Upper Madera Canyon, Santa Rita Mountains, IX, 24 and 25, 1924, (Rehn; in grass on open south slope at 5100 feet; Hebard, one in tuft of fine grass in opening of oak forest at 6200 feet), 1 ♂, 3 ♀. Lower Madera Canyon, Santa Rita Mountains, 4600 to 4900 feet, (Rehn; in tufts of fine grass on open hillside), 2 ♂, 1 ♀. Santa Rita Mountains, VI, 12, 1933 and VII, 17, 1932, (R. H. Beamer), 3 ♂, 1 ♀, 2 juv., [Univ. of Kansas.]. Patagonia Mountains, IX, 22, 1922, (Hebard; climbing on automobile), 1 ♀. Oracle, IX, 8, 1931, (E. R. Tinkham; in zone of oaks), 1 ♀. Tucson, X, 12, 1910, (Rehn and Hebard; beaten from creosote bush), 1 ♀, (very dark); XII, 1926, (G. F. Woods), 1 ♂. Tumamoc Hill, Tucson Mountains, 2400 to 3092 feet, X, 3 and 4, 1910, (Rehn and Hebard; plentiful in dry fine yellow grasses), 6 ♂, 16 ♀, 1 juv. ♂, 3 juv. ♀, (eleven very dark, evidently beaten from desert bushes). Snyder's Hill, 2500 feet, X, 11, 1910, (Rehn and Hebard; one beaten from dry grass, one attracted to light at night), 2 ♂. Sahuaro plain west of Robles Pass, Tucson Mountains, X, 5, 1910, (Rehn and Hebard), 3 ♂. Cat Mountain, Robles Pass, Tucson Mountains, 3000 feet, IX, 27, 1924, (Hebard; very scarce in tufts of fine dry yellow grass), 2 ♀. Palo Alto Rancho, Altar Valley, 3000 feet, X, 6, 1910, (Rehn and Hebard), 1 ♀. Sycamore Canyon, Baboquivari Mountains, 3700 to 4200 feet, X, 6 to 9, 1910, (Rehn and Hebard; in dry grasses, fairly common on canyon slopes, few on alluvial fan), 15 ♀, 3 juv. ♂. Schaeffer Canyon, Baboquivari Mountains, 5500 feet, IX, 19, 1924, (Rehn and Hebard), 1 ♀. Baboquivari Mountains, VII, 19, 1932, (R. H. Beamer), 1 ♀, [Univ. of Kansas]. South slope of Atascosa Peak, Pajaritos Mountains, 5500 to 6100 feet, IX, 21 and 22, 1922 and 1924, (Rehn and Hebard; in grasses, few in 1922, more numerous in 1924), 5 ♂, 4 ♀, *type*, *allotype*, *paratypes*. Hilltop north of Montana Mine, Tumacacori Mountains, 4900 to 5000 feet, IX, 21, 1924, (Rehn and Hebard; moderately common in tufts of dry fine yellow grass with immature individuals of *Achurum sumichrasti*), 1 ♂, 3 ♀ *paratypes*. Growler Valley south of Growler Pass, 1200 feet, IX, 19, 1922, (Hebard; beaten from desert vegetation in wash), 1 large juv. ♂. Valley of the Ajo, six miles north of Ajo, 1600 feet, IX, 18, 1922, (Rehn and Hebard), 3 ♂. Ajo, 1800 feet, IX, 18, 1922, (Rehn and Hebard; in creosote bush and a small gray-leaved desert brush), 3 ♂. Base of Vermilion Cliffs, eleven miles north of Pipe Springs, 5100 feet, IX, 4, 1926, (W. W. Farrar), 1 ♀. Avondale, 1000 feet, IV, 1 to 15, 1927, (O. C. Poling), 1 ♀. Fortuna, Gila Mountains, 800 feet, IX, 12, 1924, (Hebard; in a tuft of yellow weedy plant on hillside above camp), 1 juv. ♀.

OREGON: Wild Horse Canyon, Steens Mountains, 4400 feet, IX, 1, 1928, (Rehn; beaten from "Six weeks grass"), 2 ♀. Boardman, X, 5, 1922, 1 ♀, recorded by Fulton as *coloradus*.

CALIFORNIA: Needles, 600 feet, VIII, 4, 1919, (Rehn; beaten from creosote bush), 1 ♀. Goffs, 2600 feet, VIII, 5, 1919, (Rehn and Hebard; from desert plants on plain, particularly in tufts of tall dry yellow grass), 2 ♂, 2 ♀, 1 juv. ♂. Bagdad, 750 feet, VIII, 6, 1919, (Rehn; beaten from very small desert plant), 1 ♀. Barstow, 2400 feet, VIII, 7, 1919, (Hebard; resting on creosote bush on hillside), 1 ♀. Little Lake, VIII, 6, 1931, (E. R. Tinkham), 1 small juv. ♀. Paradise Valley, Tehachapi Mountains, VIII, 7, 1931, (E. R. Tinkham), 1 ♀. Cactus Flat, San Bernardino Mountains, 5900 feet, VIII, 31, 1919, (Rehn; beating), 1 ♂, 1 juv. ♂. Mill Creek, San Bernardino Mountains, 4200 feet, VIII, 30, 1919, (Rehn and Hebard), 1 small juv. ♂. Palm Springs, VI, 8, 1930, (Timberlake), 1 ♂. Pasadena, (F. Grinnell Jr.), 1 juv, recorded as *coloradus* by Rehn, [A.N.S.P.]. Nellie, VIII, 9 to 22, 1917, (E. P. Hewlett), 7 juv. ♀. Wagon pass eight miles east of Jacumba, 3700 feet, IX, 15, 1922, (Rehn and Hebard), 1 small ♂. Resort, Laguna Mountains, 6100 feet, IX, 14, 1922, (Rehn; in dry yellow grasses under pines and oaks), 1 ♀. Descanso, 3400 feet, IX, 13, 1922, (Rehn; in short dry yellow grass), 3 ♀. Dulzura, 1500 feet, IX, 12, 1922, (Rehn; from chaparral on low gravelly hills), 1 ♀.

Parabacillus coloradus (Scudder) (Pl. XX, figs. 7, 8, 9)

1903. *B[acillus] coloradus* Scudder, Psyche, VI, p. 372. [♀; [Plains of eastern] Colorado at 5500 feet.]

This species has been correctly recorded a number of times from the Great Plains and New Mexico, but all records in the literature from west of the Rocky Mountains are referable to *P. hesperus* here described.

The species is known north to Wilson Mesa, Sierra La Sal, Utah; Glenwood Springs and Fort Collins, Colorado; Pine Bluffs, Wyoming, and Capa and Chamberlain, South Dakota: east to the latter locality; Badger and Kimball, Nebraska; Syracuse, Kansas; Logan, Oklahoma, and Canadian and Sanderson, Texas: south to the Mexican boundary: west to Osborn, Arizona and in that state to the north over the entire Arizona Plateau as far as the Hualapai Mountains, and Wilson Mesa, Sierra La Sal, Utah.

Like in *hesperus*, very decided size variation occurs, the measurements of the extremes before us being as follows.

♂	Length of body	Length of pronotum	Length of cephalic femur	Length of ninth tergite
Dalhart, Texas	43.8–48.	8.6–10.7	18. –22.2	1.8 –2.05
Pulliam Bluff, Chisos Mts., Texas	48.3–53.7	10.4–11.3	19.9–21.8	1.9 –2.2
Raton, New Mexico	37. –40.3	7.7– 8.4	15. –16.2	1.75–1.9
Roswell, New Mexico	44.1–49.8	10.1–11.	18.8–19.3	2. –2.05
Cloudcroft, Sacramento Mts., New Mexico	34.2	7.4	13.8	1.75
Denton Well, New Mexico	47. –48.3	10.2–11.8	20.7–21.8	1.9 –1.9
♀				
Capa, South Dakota	50.	10.9	17.2	1.35
Badger, Nebraska	52.2	10.9	18.4	1.7
Dalhart, Texas	55.1	12.8	17.8	1.7
Pulliam Bluff, Chisos Mts., Texas	61.	13.1	21.	1.75
Raton, New Mexico	47.8	10.3	15.4	1.7
Clovis, New Mexico	62.6	13.8	20.	1.9
Paradise, Arizona	65.–72.2	15.–15.7	23.–26.7	1.4–1.7

As is true for *hesperus*, the series from the northern portions of the species distribution and at high elevations to the south (Raton and Cloudcroft, New Mexico) average decidedly smaller and stockier than those from the warmer portions of its range. To the north both species are also parthenogenetic and not a male of *coloradus* is known from north of New Mexico, Texas and Oklahoma, but strangely enough such is not the case at high elevations in boreal surroundings to the south.

The coloration of this insect is very like that of *hesperus*. Fewer dark specimens occur, however, and none of our series are as mottled with limbs closely and finely annulate as is the case in rare individuals of that species from Arizona.

In addition to considerable material previously recorded we have before us the following 172 specimens; 75 males, 74 females and 23 immature individuals.

Nebraska: Badger, VIII, 5, 1901, (L. Bruner), 1 ♀. North Platte, VII, 28, 1910, (Rehn and Hebard; in grasses near sand hills), 1 juv. ♀. Sidney, VII, 30, 1910, (Rehn and Hebard; from bunch grasses in gully), 3 ♀.

Wyoming: Pine Bluffs, (L. Bruner), 1 ♀.

Colorado: La Junta, VII, 22 and 23, 1919, (Rehn and Hebard; rare in low plants on plains), 1 juv. ♀. Las Animas County, IX, 22, 1927, (L. D. Anderson), 1 ♂, [Univ. of Kansas]. Glenwood Springs, 6100 feet, IX, 9, 1909, Rehn and Hebard; from sage brush on summit of first ridge), 1 ♀.

Oklahoma: Guymon, VIII, 15 and 16, 1921, (Rehn; in medium high grass and weeds), 3 ♂, 1 ♀ (female deep rose pink in life).

Texas. Canadian, VIII, 20, 1921, (Rehn; beaten from heavy grasses, weeds and sage brush on hills), 1 ♀. Dalhart, VIII, 17, 1921, (Rehn; numerous in high grasses), 23 ♂, 10 ♀, 1 juv. ♀. Lubbock, VIII, 21, 1921, (Hebard; in heavy weeds), 2 ♂, 7 ♀. Sanderson, VIII, 25, 1912, (Rehn and Hebard; in low grasses and plants), 1 small juv. ♀. Marathon, VIII, 20, 1919, (Rehn), 1 ♂; VIII, 26 and 27, 1912, (Rehn and Hebard), 2 ♂. Garden Spring, Brewster County, IX, 2, 1912, (Rehn and Hebard), 1 juv. ♀. Moss Well, Chisos Mountains, 4600 to 4800 feet, IX, 5 to 8, 1912, (Rehn and Hebard; only two seen), 1 ♀, 1 juv. ♀. Canyon behind Pulliam Bluff, Chisos Mountains, 4600 to 5000 feet, IX, 7, 1912, (Rehn and Hebard; moderately common at lower elevations in dry grasses), 17 ♂, 1 ♀, 2 juv. ♀. Marfa, IX, 1, 1912, (Rehn and Hebard), 1 ♂. Foothills west of Ord Mountains, Brewster County, 1928, (O. C. Poling), 3 ♀. Pine Mountain, Davis Mountains, 6300 to 7000 feet, VIII, 29, 1912, (Rehn and Hebard; moderate numbers in grasses especially in pasture at 7000 feet), 1 ♂, 2 ♀, 1 juv. ♀. Livermore Peak, Davis Mountains, 8200 feet, VIII, 30, 1912, (Rehn and Hebard; in grasses of meadow), 1 ♀. Franklin Mountains, 3800 to 5500 feet, IX, 15 and 16, 1912, (Rehn and Hebard), 5 ♀, 1 juv. ♀.

New Mexico: Raton, 6600 feet, VIII, 4, 1921, (Rehn; numerous in tall grass on rolling plains), 10 ♂, 4 ♀, 1 juv. ♀. Clifton House, 6400 feet, VIII, 4, 1921, (Rehn; beaten from tall grass in swale), 1 ♂. Wagon Mound, 6200 feet, VIII, 6, 1921, (Rehn; beaten from grasses and composites), 4 ♂, 1 ♀, 1 juv. ♂. Tucumcari, 4194 feet, VIII, 14, 1921, (Rehn; beaten from grass), 1 ♀. Clovis, 4218 feet, VIII, 22, 1921, (Rehn and Hebard; occasional in heavy taller patches of grass on plains), 9 ♀. Cameo, 4124 feet, VIII, 22, 1921, (Hebard; few in grasses of grass covered sand dune), 1 ♂. Melena, 3500 feet, VIII, 24, 1921, (Rehn; beaten from grasses), 1 ♀. Roswell, 4000 feet, VIII, 23, 1921, (Rehn and Hebard; beaten from composites on hill), 2 ♂. Carlsbad, 3300 feet, VIII, 25, 1921, (Rehn; beaten from composite), 1 ♂. Tesuque Creek, west slope of Lake Peak, Sangre del Cristo Range, 7900 feet, VII, 27, 1919, (Rehn and Hebard), 1 small juv. ♀. Jemez Mountains, 6400 feet, VIII, 25 and 28, 1916, (John Woodgate), 2 ♀, [A.N.S.P.]. Jemez Hot Springs, (John Woodgate); VII, 21, 1913, 1 juv. ♀; IX, 8 to 20, 1914, 2 ♀. Above Well Country Camp, east slope of Sandia Mountains, 8000 feet, VIII, 16, 1921, (Hebard; beaten from composites in zone of pines), 1 juv. ♀. Socorro County, VIII, 18, 1927, (L. D. Anderson), 1 ♂, [Univ. of Kansas]. Fort Wingate, VIII, 6 and 9, 1910, (John Woodgate), 2 ♀. Hachita Grande Peak, 6800 feet, IX, 27, 1922 (Hebard; in grass on steep pinyon covered slopes), 1 small juv. ♂. Canyon WNW of Hachita Grande Peak, IX, 27, 1922, (Rehn and Hebard), 1 ♀. Denton Well, Playa Valley, 4200 feet, IX, 27, 1922, (Rehn and Hebard; in rich grass), 3 ♂.

Utah: Wilson Mesa, Sierra La Sal, 6200 feet, VII, 19 to 26, 1920, (H. Skinner), 1 ♀, [A.N.S.P.].

Arizona: Paradise, VIII, 22 to IX, 1, 1915, (O. C. Poling), 4 ♀. South end of Perillas Mountains, 4500 feet, IX, 24, 1922, (Rehn and Hebard), 1 small juv. ♀. Osborn, 4700 feet, IX, 23, 1922, (Hebard; in grasses on plain), 1 juv. ♀. Bill Williams Mountain, IX, 15 to 30, 1917, (O. C. Poling), 2 ♀. Coconino County, VIII, 13, 1927, (R. H. Beamer), 1 ♀. Dewey, IX, 8, 1917, (O. C. Poling), 1 ♀. Prescott, VIII, 14, 1917, (J. A. Kusche), 1 juv. ♀. Mount Trydal, 7300 feet, VIII, 27 and 28, 1917, (J. A. Kusche), 1 juv. ♀. Senator, VIII, 12, 1917, (J. A. Kusche), 2 juv. ♀. Kingman, VIII, 2, 1919, (Hebard; beaten from "rabbit weed" (a low composite)), 1 juv. ♀. Wheeler Canyon, Hualapai Mountains, V, 30, 1920, (O. C. Poling), 1 ♀. Hualapai Mountains, VII, 25, 1920, (O. C. Poling), 1 ♀.

Explanation of Plate XX

(Figures much enlarged.)

Fig. 1.—*Diapheromera torquata* new species. Male. *Type.* Lost Mine Peak, Chisos Mountains, Texas. Dorsal view of distal portion of abdomen.

Fig. 2.—*Diapheromera torquata* new species. Male. *Type.* Lost Mine Peak, Chisos Mountains, Texas. Lateral (sinistral) view of distal portion of abdomen.

Fig. 3.—*Diapheromera torquata* new species. Male. *Type.* Lost Mine Peak, Chisos Mountains, Texas. Dextral view of poculum.

Fig. 4.—*Diapheromera* torquata new species. Male. *Type.* Lost Mine Peak, Chisos Mountains, Texas. Sinistral view of poculum.

Fig. 5.—*Parabacillus hesperus* new species. Male. *Type.* Atascosa Peak, Pajaritos Mountains, Arizona. Dorsal view of distal portion of abdomen.

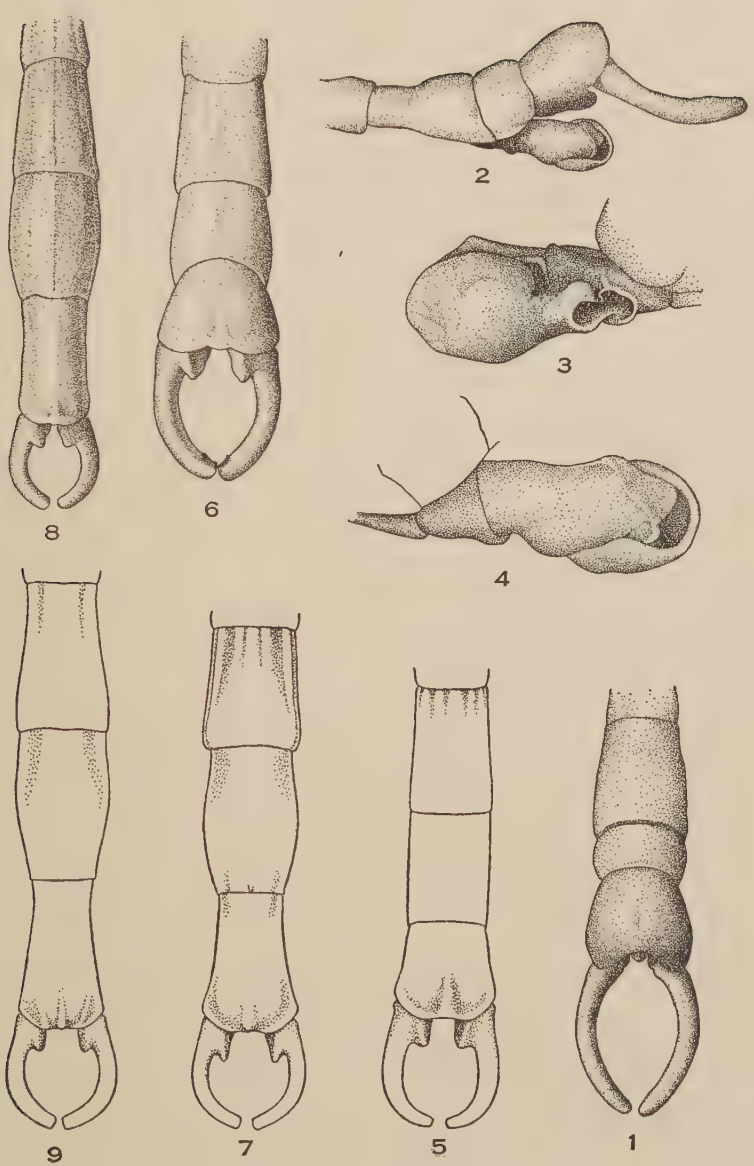
Fig. 6.—*Parabacillus hesperus* new species. Male. Goffs, California. Dorsal view of distal portion of abdomen.

Fig. 7.—*Parabacillus coloradus* Scudder. Male. Las Animas County, Colorado. Dorsal view of distal portion of abdomen.

Fig. 8.—*Parabacillus coloradus* Scudder. Male. Canyon behind Pulliam Bluff, Chisos Mountains, Texas. Dorsal view of distal portion of abdomen.

Fig. 9.—*Parabacillus coloradus* Scudder. Male. Denton Well, Playa Valley, New Mexico. Dorsal view of distal portion of abdomen.

The several figures of the distal portion of the male abdomen for the two species of *Parabacillus* are given to show that, although decided variation in attenuation of individuals of each species occurs, the great specific difference in proportions of the penultimate tergite does not vary. Figure 5 is of a very attenuate specimen of *hesperus*, figure 6 of an unusually robust specimen of the same species. Figures 7 and 8 are of normal specimens of *coloradus* but the penultimate tergite in 8 has curled inward disto-ventrad more that is usual (possibly in drying), while figure 9 is of an exceptionally attenuate specimen of the same species.



HEBARD—NORTH AMERICAN ORTHOPTERA

DESCRIPTIONS OF TWELVE NEW SPECIES OF TIPHIIDAE FROM THE UNITED STATES WITH TAXONOMIC NOTES

(HYMENOPTERA)

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In 1918, Malloch[1] described nineteen new species of Tiphiidae principally from the eastern part of the United States, in what was perhaps the most significant contribution to the taxonomy of the North American species of the family to date. Various publications from 1810[2] include descriptions of a number of other species of North American *Tiphia*. Investigations conducted by the Bureau of Entomology of the United States Department of Agriculture during the past ten years, in connection with the effort to introduce parasites of the Japanese beetle (*Popillia japonica* Newm.) have proved that the taxonomy of the North American species of this family is as yet only partly understood, and that a considerable number of the species frequently collected are undescribed. Several of these are described in this paper. Taxonomic notes on previously described species are also included.

Considerable confusion in the taxonomy of Tiphiidae has resulted from the practice of describing species from a number of specimens which are considered as cotypes, and by attempting to associate sexes on insufficient evidence. In a group in which diagnostic characters are so minute, and variable, and in which the two sexes infrequently have valuable diagnostic characters in common, it is highly desirable to designate a holotype. In most of the North American species in which the two sexes have been associated, the relationship has been based on collecting

[1] Ill. Nat. Hist. Survey Bul., XIII, pp. 1–24.

[2] Klug, Beitr. z. Naturk., II, p. 184.

both male and female in the same restricted locality on the same date. In a group which is decidedly protandrous, and in which several species frequently occur simultaneously in the same locality, this method often leads to mistakes, unless the series collected is large and free of inclusions. It is true that when a considerable number of new species are described from one sex only, it will eventually be found that in many cases the same species has been described under one name for the female and under another for the male. However, errors of this nature are more easily adjusted than those resulting from the incorrect association of the sexes.

Unfortunately Robertson's collection at Carlinsville, Illinois was not accessible to me for study at the time types in the collection of the Illinois Natural History Survey were examined. So, redescriptions of the species he described have been based on cotypic material deposited by him in collections other than his own. In such cases lectotypes have not been designated.

This paper is a contribution of the Japanese Beetle Project, Bureau of Entomology, for which the writer has been making a taxonomic study of the indigenous species of Tiphia since 1929. It is based on a study of specimens in the collection at the Japanese Beetle Laboratory, Moorestown, New Jersey [J.B.L.], the collections of the Illinois Natural History Survey, Urbana, Illinois [I.N.H.S.], and the Museum of Comparative Zoology, Cambridge, Massachusetts, and specimens loaned by the United States National Museum [U.S.N.M.], the Academy of Natural Sciences of Philadelphia [A.N.S.], and Dr. C. H. Kennedy [K].

Neotiphia luteipennis (Cresson), new combination

1865. *Tiphia luteipennis* Cresson, Proc. Ent. Soc. Phila., IV, p. 445.
1918. *Tiphia luteipennis* Malloch, Ill. Nat. Hist. Survey Bul., XIII, p. 10.

The type female in the collection of the Academy of Natural Sciences of Philadelphia has been examined, and found to belong, unquestionably, to the genus *Neotiphia*, having the distinctive oral and wing characters, mentioned by Malloch, as well as a broad shagreened medial stripe on the sixth sternite, which I find to be characteristic of the females of several species of the genus.

Neotiphia sulcata (Roberts), new combination

1918. *Tiphia canaliculata* Malloch, Ill. Nat. Hist. Survey Bul., XIII, p. 10. (Not *canaliculata* Cameron.)

1930. *Tiphia sulcata* Roberts, Can. Ent., LXII, p. 190. (New name for *canaliculata* Malloch.)

This species was originally described as *Tiphia canaliculata*, a name preoccupied by an Indian species. The type, a male from Chimney Gulch, Colorado, in the Museum of Comparative Zoology, Cambridge, Mass., has been examined, and found to be unquestionably a *Neotiphia*. It has the oral characters described by Malloch, in erecting the genus, as well as a broad, shallow, median groove on the sixth sternite, and broad, sharply defined, translucent, polished apices to the abdominal segments, all of which are easily distinguished characteristics of the male in this genus.

Tiphia transversa Say

1828. *Tiphia transversa* Say, Contrib. Maclurian Lyceum Arts & Sci., I, p. 83; 1859. (Compl. Writings, LeConte Ed., I, p. 385.)

I have examined a specimen in the collection of the Boston Society of Natural History bearing the label "*Tiphia transversa*." Dr. C. W. Johnson has informed me that the label is in the handwriting of Thomas Say, and that the specimen is one of the very few still in existence that were determined by that worker. The specimen is a male, 11 mm. long, with the distinctive elongated tegula which characterizes the common species long recognized as *transversa*. Say's specimen does not correspond exactly with any that I have examined, but there seems to be a considerable range of variation in the group. At present I am of the opinion that all variants I have examined which run to this species in Malloch's[3] key should be considered conspecific.

Tiphia micropunctata new species

Both sexes run to *inornata* Say in Malloch's key and comprise part of the material he included in that species. The female is distinguished by its large size, the abrupt apical constriction of the areola, and the conspicuous minute punctures on the anterior aspect of the first tergite. The male is distinguished from other

[3] Ill. Nat. Hist. Survey Bul., XIII, p. 5 and 7, (1918).

species, except *dentata*, n. sp., by the prominent anterior denticle of the mandible and the tuft of yellow hairs on the sixth sternite.

Female. Vertex irregularly coarsely punctate, with polished interspaces wider than ocellus; without minute punctures[4] on the dorsal aspect. Front with coarse contiguous punctures on lower half, sparser above, without interspaces wider than ocellus; secondary punctures inconspicuous. Clypeus with its median extension as long as the diameter of the antennal fossa, impunctate for half the distance to the antennal fossa, apex broadly arcuate, scarcely bilobate; lateral margin not abruptly depressed, visible, in front view, to base of mandibles; lateral groove, mediad, shallowly and horizontally excavated below a weakly developed lateral carina. Dorsum of pronotum with transverse carina usually visible on not more than the lateral third; the anterior portion densely and uniformly coarsely punctate, secondaries almost lacking, the punctate portion medially shorter than the impunctate apex. Side of pronotum with fine rugae ventrally, sparse punctures above, vaguely grooved across the middle. Prosternum with disk polished and coarsely punctate without conspicuous minute punctures. Scutum with unusually deep notauli distinctly separated from the short antero-medial groove. Mesepisternum with its outer disk moderately beset with punctures of several sizes. Hind basitarsus without a longitudinal groove. Tegula polished, with a shallow groove on the antero-lateral border. Radial cell open, without an apical stump. Areola twice as long as greatest width, the sides sinuous and abruptly convergent apically. Side of propodeum with its upper rugose portion sharply defined, the rugae long, sharp, and closely spaced; lower portion coarsely shagreened, without distinct minute punctures. First tergite with its anterior aspect covered with a broad patch of dense, conspicuous, minute punctures; the preapical band of unusually small primary punctures closely set in a narrow irregular row which is not deeply impressed. First sternite with its disk flat, elevated, without trace of lateral grooves; uniformly minutely punctate with deep primaries anteriorly. Intermediate tergites with dense, narrow concentrations of fine primary punctures, caudad of a polished, nearly impunctate band; the impunctate nonmembranous apices unusually narrow, not wider than the largest adjacent primaries. Pygidium rugoso-punctate on basal three fifths, frequently with a narrow, impunctate, medial indentation; impunctate portion strongly wrinkled and shagreened excepting on narrow, polished apex. Length 13.0 to 18.0 mm.

[4] For definition of characters used see Allen and Jaynes, Proc. U. S. Nat. Mus., LXXVI, Art. 17, 1930.

Male. Vertex densely punctate except impunctate spaces laterad of and nearly as wide as the ocelli; dense, conspicuous, minute punctures on caudal aspect, somewhat sparser dorsad of ocelli. Front with the primaries not contiguous though without interspaces as wide as an ocellus, with dense, interspacial, minute punctures conspicuous to ocelli. Cheek slightly wider than antennal fossa. Clypeus with its median extension moderately protruding, slightly longer than width of antennal fossa, abruptly produced to a slightly bilobate apex which is nearly as wide as the distance between lateral margins of antennal fossae and impunctate one fourth the distance to antennal fossae; disk nearly flat, deeply punctate, the upper portion with well defined minute punctures; lateral margin abruptly depressed to a point midway between the median extension and the eye, in front view, coinciding with the well defined, angular lateral carina, from which it is separated by a vertically excavated lateral groove deeply cut into side of clypeal extension. Mandible with a strong denticle on the upper margin near the apex which is separated from the main tusk by a deep V-shaped incision. Dorsum of pronotum with a high, complete transverse carina; the anterior portion with punctures of uniform first-degree density and with broadly interspersed minute punctures. Side of pronotum broadly aciculate, with a well defined groove across the middle. Mesepisternum on outer disk with medium punctures of first-degree density interspersed by minute punctures, which are more numerous than the primaries. Tegula polished opaque to margin, with marginal groove sometimes complete, sometimes lacking, but usually faint or present and interrupted at the outer apical angle. Wing with the cubital cell exceeding the radial, the apical abscissae of both inclined inwardly toward costa. Side of propodeum with the upper rugose portion clearly defined from the lower portion, which is completely shagreened. First tergite without transverse carina or groove; the anterior aspect densely beset with fine punctures; the dorsum broadly impunctate; the preapical band wide, shallowly impressed, and consisting of medium, well separated punctures. First sternite with its disk scarcely longer than the posterior fossa; with a prominent, deep, crenulate posterior fossa usually bordered laterally by short narrow ridges; obscurely minutely punctate on the caudal half. Intermediate tergites finely punctate, with sparsely punctate areas laterally between the denser anterior and posterior concentrations; impunctate apices scarcely wider than the largest primaries, with a continuous microscopic groove over the dorsa on segments 3 to 5 inclusive. Fifth sternite without denticle. Sixth sternite with a dense conspicuous tuft of long yellow hair. Length, 10.0 to 13.5 mm.

Type.—Female; Marquette, Michigan, [U.S.N.M. No. 50493].

Allotype.—Male; South Bass Island, Ohio, July 1–10, 1924, [U.S.N.M.].

Paratypes.—1 ♂, Trout Lake, Wisconsin, June 22, 1914, (J. J. Davis); 1 ♀, Cranmoor, Wisconsin, June 27, 1910, (C. W. Hooker); 1 ♀, Michigan; 1 ♀, Ann Arbor, Michigan; 1 ♀, Chicago, Illinois, (Chittenden); 1 ♂, Detroit, Michigan; 1 ♀, Texas, (Belfrage); 1 ♀, no locality, [all U.S.N.M.]. 3 ♀, New Jersey; 1 ♀, White Mts., New Hampshire; 1 ♀, Niagara Falls, New York, June 24, 1901; 2 ♀, Ames, Iowa, (E. D. Ball); 2 ♀, North Carolina; 1 ♀, Montana; 1 ♀, Canada; 1 ♀, no locality, [all A.N.S.]. 1 ♀ and 1♂, June, 5 ♂, July, South Bass Island, Ohio; 3 ♀, June, 2 ♀, July, Douglas Lake, Michigan, [all K.].

I have also seen three females from C. H. Kennedy with no labels, and one from the Academy of Natural Sciences of Philadelphia, Canada, (W. J. Fox), which differ from the type in having a distinct transverse carina complete across the anterior pronotum. I have seen another female from Virginia.

Tiphia inornata Say

1824. *Tiphia inornata* Say, Keating's Narr., Exped. to Source St. Peter's River, II, p. 223. (In part only the *T. inornata* of Malloch and other authors.)

Female. Agrees with the description of *micropunctata* except as noted below. Dorsum of pronotum with transverse carina completely lacking. Sides of pronotum without trace of rugulae across the middle. Dorsum of propodeum with areola subrectangular, not suddenly constricted apically, 2.3 times as long as greatest width, anterior aspect of first tergite with its patch of minute punctures small, subobsolete, and inconspicuous. Intermediate tergites without an impunctate or nearly impunctate band immediately preceding the apical concentration of punctures. Pygidium with its impunctate portion strongly shagreened and longitudinally wrinkled to near the apex, which is concentrically wrinkled. Length, 14.0 mm.

Remarks.—Redescribed from a single specimen in the collection of the Boston Society of Natural History, bearing the label "*Tiphia inornata* Nob." Dr. C. W. Johnson has stated that the label is in Say's handwriting and represents one of the very few

existing specimens determined by Say. The specimen is in rather poor condition, having lost all but three joints of one antenna and the tarsi of the last four legs, and most of the vestiture. It runs to *inornata* in Malloch's key and is related, without doubt, to *inornata* as recognized by several writers, but does not match any other specimens I have seen. It is unquestionably distinct from the common species called *inornata* by Malloch and other authors.

Tiphia infossata new species

This species runs to couplet 6, and usually to *inornata*, in Malloch's key. The female can be readily distinguished from that of *micropunctata* by the longer rectangular areola, the absence of the broad patch of conspicuous minute punctures on the first tergite, and the much coarser punctation of the abdomen. It differs from the female of *inornata* in having a complete transverse carina on the pronotum and a well developed groove across the middle of the side of the pronotum, and in having the apex of the pygidium polished and not concentrically wrinkled.

Female. Agrees with description of *micropunctata* except as noted below. Dorsum of pronotum with its anterior transverse carina complete. Side of pronotum with a strong groove or a series of impressions across the middle, elsewhere finely aciculate. Areola somewhat more than twice as long as greatest width, subrectangular, the sides straight and not abruptly convergent apically. First tergite with its anterior aspect coarsely punctate at the sides, the patch of minute punctures, if present, usually small, subobsolete, and inconspicuous; preapical band wide, not deeply impressed, and composed of coarse, well separated punctures. Each intermediate tergite with a broad apical concentration of coarse punctures. Length, 10.0 to 15.5 mm.

Type.—Female; Moorestown, New Jersey. July 22, 1924. (J. B. Cronin). [U.S.N.M. No. 50494].

Paratypes.—All females; 8, Texas, (Belfrage); 2, Rosslyn, Virginia, (Chittenden); 2, Washington, District of Columbia; 1, Kanawha Sta., West Virginia, June 26, 1918, (S. A. Rohwer); 1, Bedford, Indiana, June 19, 1917, (J. J. Davis); 1, Buck Creek, Indiana, June 27, 1916, (Fenton and Mason); 1, Illinois, (G. N. Wolcott); 1, Wadley, Alabama, (H. H. Smith), [all U.S.N.M.]. 4, Moorestown, New Jersey, July 22–25, 1924, (J. B. Cronin); 1, Trenton, New Jersey, Aug. 20, 1924, (J. B. Cronin), [all J.B.L.].

Other material examined: In the collection of the United States National Museum, one female, Falls Church, Virginia, and one female, Louisiana, resemble *micropunctata* in the absence of a carina on the pronotum and in having an abundance of minute punctures on the first tergite, but they do not have the distinctive areola and the abdominal punctation of that species.

Tiphia confusa new species

This species runs to *clypeata* in Malloch's key. The female can be readily separated from that of *micropunctata* by the absence of conspicuous minute punctures on the first tergite; from *inornata*, by the presence of grooves across the middle of the sides of the pronotum and by the smooth polished tip of the pygidium; from *infossata*, by the presence of a conspicuous apical row of minute punctures over the dorsum of the intermediate tergites.

Female. Agrees with the description of *micropunctata* except as noted below. Dorsum of pronotum with its punctate portion usually as long as the impunctate portion. Radius with a short apical stump just before the apex of the second cubital cell. Areola subrectangular, its sides straight and not suddenly constricted apically. First tergite without a patch of dense, conspicuous, minute punctures on its anterior aspect; preapical band wide, not impressed, and consisting of coarse, well separated punctures. The third and fourth tergites with a continuous row of impressions and minute punctures over the dorsum apically; the apical concentration of coarse punctures broad and sharply defined, with a polished nearly impunctate band immediately cephalad, posterior primary punctures well separated from the apical groove; on tergites 2 and 3 the nonmembranous apex caudad of the primaries several times the width of the largest adjacent punctures. Length, 13.0 to 16.0 mm.

Type.—Female; Tampa, Florida. [U.S.N.M. No. 50495].

Paratype.—1 ♀; North Carolina, [A.N.S.].

In the collection of the United States National Museum, one female from Lehigh Gap, Pennsylvania, July 15, 1907, (G. M. Greene), differs in being smaller, with the impunctate apices of the abdominal tergites not so wide as in the type series. Another female, from Falls Church, Virginia, June 17, 1907, (G. M. Greene), is similar to the last, but has a more elongate areola. These last two specimens are doubtfully referred to this species.

Tiphia dentata new species

This species runs to *inornata* in Malloch's key. It is readily distinguished from all others except *micropunctata* by the conspicuous denticle on the upper, apical margin of the mandible, and by the dense tuft of long yellowish hair on the sixth sternite. From *micropunctata* it differs in being smaller, in having a more conspicuous groove encircling the tegula, and in characters of the first sternite described below.

Male. Agrees with description of *micropunctata* except as follows: Tegula with a deep uninterrupted groove encircling the outer margin. First sternite with its disk distinctly longer than the posterior transverse sulcus; gradually depressed caudally to the transverse sulcus, with well defined lateral grooves flanked on the outside by elongate narrow ridges; usually with only a few scattered minute punctures. Length, 8.0 to 10.5 mm.

Type.—Male; Riverton, New Jersey. June 9, 1924. (G. Spencer). [U.S.N.M. No. 50496].

Paratypes.—All males; 1, Washington, District of Columbia; 1, Wenonah, New Jersey, May 15, 1910, (G. M. Greene); 1, Great Falls, Virginia, (H. H. Smith); 1, Inglenook, Pennsylvania, May 28, 1911, (W. S. Fisher), [all U.S.N.M.]. 1, New Jersey, June 8, 1928, (R. J. Sim); 1, New Lisbon, New Jersey; 1, Lucaston, New Jersey, May 30, 1902, [all J.B.L.]. 1, Thomasville, Georgia, April 16, 1903; and 1, Canada, [both A.N.S.].

Tiphia hollowayi new species

This species runs to *vulgaris*, or to couplet 24 in Malloch's key.

Male. Vertex coarsely punctate, without interspaces as wide as an ocellus; posterior aspect broadly and conspicuously minutely punctate, the dense minute punctures usually extending cephalad to the ocelli. Front with punctures contiguous on lower two thirds, and without interspaces nearly as wide as the ocellus; minute punctures everywhere abundant and conspicuous. Antennocular line equal to diameter of antennal fossa. Clypeus with its median extension as long as diameter of antennal fossa, the apex abruptly produced, bidentate, upturned, and narrowly impunctate on apical sixth; disk flat, coarsely punctate ventrad, densely minutely punctate dorsad; lateral margin abruptly depressed from denticle, in front view not concealed by the weak lateral carina. Mandibles at most with a small emargination near the apex. Pronotum with a sharp, complete, transverse carina; punctures uniformly of first-degree density, with minute

punctures on lateral disks distinctly less numerous than the primaries; the punctate portion medially twice as long as the impunctate apex. Side of pronotum with the anterior carina reduced to a low fold; strongly aciculate and rugose, with a distinct groove across the middle. Mesepisternum densely bipunctate, the minute punctures everywhere more numerous than the coarse primaries; posterior premarginal groove complete to spiracle. Tegula polished piceous with a groove usually continuous about the outer and hind margin, sometimes interrupted at outer apical angle. Wing with the second cubital cell distinctly exceeding the radial, the apical abscissa of the radius, over most of its length, directed inwardly. Dorsum of propodeum with crenulation anterior to transverse carina, elsewhere finely wrinkled; areola rectangular or slightly tapering toward apex, with sides straight or moderately convex and with a broadly truncate apex. Side of propodeum on upper portion with moderately well developed rugae; lower portion impunctate, with dull shagreening. First tergite usually without transverse carina or groove except occasionally a vestigial one; coarsely punctate, the preapical band broad, shallowly impressed, and consisting of coarse contiguous punctures, cephalad of which is a broad nearly impunctate area. First sternite narrow and elongated, distinctly longer than the conspicuous crenulate posterior sulcus, which is abruptly impressed on its anterior margin, bounded laterally on the posterior third by narrow folds; minute punctures usually sparse, the anterior half broadly coarsely punctate. Intermediate tergites uniformly coarsely, and deeply punctate, polished, without conspicuous concentrations; impunctate apices about as wide as largest primaries, with uninterrupted rows of minute punctures and impressions over the dorsum. Fifth sternite without trace of a denticle. Sixth sternite with dense fine hairs not differentiated into conspicuous tufts. Length, 8.5 to 11.0 mm.

Type.—Male; Langhorne, Pennsylvania. June 9, 1927. [U.S.N.M. No. 50497].

Paratypes.—All males; 5, Langhorne, Pennsylvania, June 9, 1927; 6, Andalusia, Pennsylvania, May 21, 1930, (J. K. Holloway); 2, Plummer's Is., Maryland, June 10, 1917, (G. M. Greene); 2, Enola, Pennsylvania, June 12, 1909 (W. S. Fisher), [all U.S.N.M.]. 3, Langhorne, Pennsylvania, June 2, 1927, (R. J. Sim); 11, Langhorne, Pennsylvania, June 9, 1927; 4, Andalusia, Pennsylvania, May 21, 1930, (J. K. Holloway); 1, Moorestown, New Jersey, July 9, 1924, (L. B. Parker), [all J.B.L.]. 4, Hartford, Connecticut, May; 1, Westville, New Jersey, June 6, 1897, [all A.N.S.]. 6, Hocking Co., Ohio, May, [K.].

Other material examined: 2 ♂, New Lisbon, New Jersey, May '27; 1 ♂, Plummer's Is., Maryland, June; 3 ♂, North Carolina; 1 ♂, June 1, 1909; 6 ♂, May 24, 1911, State College, Pennsylvania, (W. R. McConnell); 2 ♂, Richland, Michigan, April 25, 1918, (C. F. Turner).

Tiphia vulgaris Robertson

1901. *Tiphia vulgaris* Robertson, Trans. Amer. Ent. Soc., xxvii, p. 195.
1918. *Tiphia vulgaris* Malloch, Ill. Nat. Hist. Survey Bul., xiii, p. 12.

Described by Robertson from thirty-seven male and eight female cotypes from Carlinsville, Illinois, the sexes evidently associated on the basis of being collected at the same time and locality. The male differs from that of *hollowayi* in the nature of the punctation of the front and pronotum, the width and sculpturing of the first sternite, and usually in the presence of vestigial sternal denticles. The female type material I have not seen, but the following descriptive notes are based on specimens determined by Malloch. The female is readily distinguished from others that I have seen by the absence of a groove on the basitarsus, the very narrow impunctate apex of the pygidium, and the dense, conspicuous, minute punctures of the prosternum.

Male. The cotype male in the collection of the Academy of Natural Sciences of Philadelphia and another cotype in the United States National Museum collection differ from the description of *hollowayi* in the following characters: Front with primary punctures scarcely of first-degree density. Lateral disks of the dorsal pronotum with minute punctures much more numerous than the primaries. First tergite without a transverse carina or groove. First sternite broad, scarcely longer than the posterior sulcus, which is usually shallow and subobsolete; disk usually devoid of coarse punctures. Fifth sternite, frequently, and sometimes the fourth, with vestigial lateral denticles.

Female. Vertex sparsely and irregularly punctate, with impunctate interspaces nearly twice as wide as ocellus. Front rather sparsely and irregularly punctate though without impunctate interspaces as wide as ocellus except on median line; interspersed secondaries on lower half. Cheek about twice as wide as antennal fossa. Clypeus with its median extension sublobate and arcuate, without an abrupt median projection; about as long as diameter of antennal fossa; apex polished and impunctate on lower two fifths; lateral margin in front view clearly visible to base of mandible; lateral carina short and low, not masking even the

broad shallow lateral groove. Dorsum of pronotum with its transverse carina lacking or weakly developed; with moderate-size, punctures more dense just cephalad of impunctate apex. Side of pronotum with its anterior carina straight, the crest broadly rounded and abruptly decreased at the humeral angle; broadly rugulose and shagreened, with indistinct impressions across the middle. Prosternum broadly and densely beset with conspicuous minute punctures. Mesepisternum on the outer disk sparsely and irregularly punctate with punctures of many different sizes. Tegula polished black with thickened edges; outer margin with a shallow groove not continuous about the outer apical angle. Radius of the wing without a well defined spur at is apex. Hind basitarsus without a groove. Dorsum of propodeum scarcely sculptured except for fine shagreening and fine punctures beside areola; latter rectangular or slightly tapering with straight sides, twice as long as greatest width. Lower portion of side of propodeum faintly shagreened, polished, and perceptibly setuloso-punctate. First tergite with a broad patch of conspicuous minute punctures on the anterior aspect, its dorsum finely punctate; the preapical band narrow medially and shallowly impressed. First sternite with its disk broadly and minutely setuloso-punctate, without lateral groove. Intermediate tergites with the punctures moderate sized, somewhat sparser cephalad of apical concentrations; impunctate apices scarcely twice the width of adjacent punctures and sharply differentiated from the apical membranous bands, without rows of minute punctures or impressions over the dorsum. Pygidium densely reticulato-punctate to the lowest fifth, more reticulate than punctate, the narrow impunctate apex clearly defined and at least four times as wide as long. Length, 12.0 to 14.0 mm.

Redescription was made from the following material: A cotype, male, in the collection of the Academy of Natural Sciences of Philadelphia. 1 cotype, ♂, No. 6827, Carlinsville, Illinois; 1 ♂, Hendrix, Illinois, May 13, 1913, (G. N. Wolcott); 1 ♀, Champaign, Illinois, Sept. 25, 1912, (G. N. Wolcott); 1 ♂, Illinois, 1912; 1 ♀, Elk Point, South Dakota, May, 1913, (C. N. Ainslie); 1 ♂, St. Louis, Missouri, May 29, 1920, (P. Rau), [all U.S.N.M.]. 1 ♀, Freeport, Illinois, July 4, 1917; 1 ♂, Galena, Illinois, June 6, 1917; 1 ♀ and 1 ♂ without locality labels, [all I.N.H.S.].

Tiphia convexa new species

This species runs to couplet 24 in Malloch's key. It can be separated from *hollowayi*, n. sp., on characters given in the description below, and from *vulgaris* by the carina on the dorsum of

the first tergite, the obsolete minute punctures on the posterior slope of the vertex, and the absence of a vestigial denticle on the fifth sternite.

Male. Agrees with the description of *hollowayi*, n. sp., except as follows: Vertex with minute punctures obsolete and inconspicuous. Front with the primary punctures coarser and more shallow. Clypeus with the median extension broadly arcuate, usually faintly bilobate, never distinctly bidentate, or upturned with a very narrow impunctate apex. Side of pronotum with its anterior carina sharp and high. Punctures of mesepisternum distinctly coarser. Areola not tapering, with its sides conspicuously convex. Side of propodeum with high conspicuous rugae. First tergite usually with a strong transverse carina; without a distinct impunctate space cephalad of the preapical band. First sternite usually with the lateral folds beside the apical sulcus much wider and less conspicuous. Length, 8.5 to 10.5 mm.

Type.—Male; New Lisbon, New Jersey. June 1–5, 1927. [U.S.N.M. No. 50498].

Paratypes.—All males; 10, New Lisbon, New Jersey, June 1–5' 1927, [U.S.N.M.]. 40, New Lisbon, New Jersey, May 31–June 5, 1927; 2, Four Mile, New Jersey, May 30, 1927, [all J.B.L.]. 1, Ocean Grove, New Jersey, July 12, 1893, [A.N.S.].

A series of thirteen males labeled "Montana," belonging to the Academy of Natural Sciences of Philadelphia, differ slightly from the New Jersey specimens in having, usually, an impunctate area cephalad of the preapical punctate band of the first tergite.

Tiphia crassipunctata new species

This species runs to *vulgaris* in Malloch's key. It differs from *vulgaris* in having the primary punctures of the front larger and closer, the disks of the dorsal pronotum nearly devoid of minute punctures, and the pronotal transverse carina lacking or poorly developed medially. It is separated from *hollowayi*, n. sp., by the coarser, denser primary punctures of the front, the poorly developed transverse carina of the pronotum, and the lack of a transverse carina on the first tergite. It is separated from *convexa*, n. sp., by the concave-sided areola.

Male. Agrees with the description of *hollowayi*, n. sp., except as follows: Front completely covered with contiguous punctures except narrow median stripe, nearly devoid of minute punctures though secondaries moderately abundant. Clypeus with its

median extension subtruncate, the disk moderately convex. Pronotum usually with a transverse carina, lacking or broadly interrupted medially. Areola not tapering and with concave sides. Side of propodeum on upper portion with very fine rugulae. First sternite short and broad; posterior sulcus not abruptly impressed on anterior border, lateral folds short and wide, sometimes with abundant minute punctures caudally. Intermediate tergites with wide, polished, impunctate apices several times broader than the largest adjacent primary punctures. Length, 9.0 to 12.0 mm.

Type.—Male; North Carolina. [A.N S.].

Paratypes.—3 ♂; North Carolina. [A.N.S.].

Tiphia raui new species

This species runs to couplet 5 in Malloch's key. It is closely related to *vulgaris*, from which it may be separated by the absence of conspicuous minute punctures on the prosternum, and the anterior aspect of the first tergite.

Female. Agrees with the redescription of *vulgaris* except as follows: Vertex without interspaces wider than an ocellus. Front with coarse round punctures of first-degree density on lower half, somewhat sparser above though without impunctate interspaces as wide as an ocellus; interspacial minute punctures lacking. Clypeus with its median extension shorter than diameter of antennal fossa; apex subtruncate for a distance as great as distance between lateral margins of antennal fossae, polished and impunctate one half distance to base of antennae; lateral margin abruptly depressed, in front view, concealed beneath the well developed lateral carina from a point below the outside of the antennal fossa to the inner eye margin. Dorsum of pronotum with its transverse carina complete except for narrow medial interruptions and evenly continuous over the sides as the anterior carina of the pronotum; punctures very coarse and uniformly distributed. Side of pronotum with conspicuous rugae from ventral corner to near middle and without a well developed groove or grooves across the middle. Prosternum without conspicuous minute punctures on the disk. Mesepisternum on its outer disk with round, unusually coarse punctures uniformly distributed, without interspacial minute punctures. Tegula with a groove about the outer and hind margins narrowly interrupted at the outer apical angle. Radius of the wing with a very short spur before its apex and directed inwardly. First tergite without a conspicuous patch of minute punctures on its anterior aspect. First sternite with lateral grooves on the posterior fourth. Tergites 2 and 3 with the impunctate apices several times as wide as the largest adjacent

punctures. Pygidium reticulato-punctate on upper three fourths, more definitely punctate than reticulate, the lower margin of the punctate portion with a broad, clearly defined indentation; the impunctate portion sharply defined, shagreened except for the narrow polished apex. Length, 13.0 mm.

Type.—Female; St. Louis, Missouri. September 12, 1918. (P. Rau). [U.S.N.M. No. 50499].

Tiphia unica new species

This species runs to couplet 5 in Malloch's key, and is also closely related to *vulgaris*, from which it is separated by the absence of dense, conspicuous, minute punctures on the prosternum and the anterior aspect of the first tergite. It is distinguished from *raui*, n. sp., by the prominently produced median extension of the clypeus and the coarser punctation of the front and abdominal tergites.

Female. Agrees with the redescription of *vulgaris* except as follows: Front densely beset with very large, contiguous, primary punctures, without impunctate interspaces as wide as an ocellus; interspacial minute punctures lacking. Clypeus with its median extension narrowly and prominently arcuate, produced for a distance equaling one and one third the diameter of the antennal fossa; apex polished impunctate one half the distance to base of antennae; lateral margin in front view not concealed at any point beneath the short lateral carina, which extends medially to a point below the outside of the antennal fossa; lateral groove short, deep, excavated from below. Dorsum of pronotum with a transverse carina complete and strongly developed; anterior portion with very coarse punctures. Side of pronotum with its anterior carina smoothly continuous with the transverse dorsal carina; disk very coarsely and irregularly rugose with the most prominent sculpturing across the middle. Prosternum shagreened, very coarsely punctate, and devoid of dense minute punctures. Mesepisternum on its outer disk perceptibly shagreened, uniformly covered with very coarse contiguous punctures. Tegula with a marginal groove deeper and more nearly continuous about the outer and hind margins. Radius of the wing with a short spur before its apex, directed inwardly. First tergite without a broad patch of conspicuous minute punctures on its anterior aspect, its dorsum coarsely punctate. Intermediate tergites with coarse conspicuous punctures. Pygidium prominently rugose on upper three fourths. Length, 14.0 mm.

Type.—Female; Thomasville, Georgia. March 24, 1903. [Acad. Nat. Sci. Phila., no. 4167].

Tiphia intermedia Malloch

1901. *Tiphia punctata* Robertson, Trans. Amer. Ent. Soc., XXVII, p. 196. (Not of F. Smith.)
1918. *Tiphia punctata* Malloch, Ill. Nat. Hist. Survey Bul., XIII, p. 20.
1918. *Tiphia punctata* var. *intermedia* Malloch, Ill. Nat. Hist. Survey Bul., XIII, p. 21.
1918. *Tiphia reticulata* Malloch, Ill. Nat. Hist. Survey Bul., XIII, p. 23.
1930. *Tiphia intermedia* var. *exitialis* Roberts, Can. Ent., LXII, p. 189.

The name *punctata* was proposed by Robertson for a single male from Carlinsville, Illinois. Malloch determined a large number as *punctata* Robertson, and associated the female, evidently on the basis of collections made of both sexes at the same time and locality. Malloch recognized and described a variety, *intermedia*. Roberts indicated that the name *punctata* Robertson was preoccupied by *Tiphia punctata* from Japan described by Smith in 1873. He indicated that Robertson's species should be called *intermedia* Malloch and proposed the new variety name *exitialis* for the variety name *intermedia*. I have studied some of Malloch's determinations of *intermedia exitialis* in the collection of the Illinois Natural History Survey and the Museum of Comparative Zoology, and also two cotype females of *T. reticulata* described by him from specimens collected at Falls Church, Virginia, Sept. 26 and 28, (N. Banks), and in the collection at the Museum of Comparative Zoology, labeled "type #10,228." The shagreening on the ventral surface of the thorax, used to distinguish *reticulata* from *intermedia*, has been found to be unreliable. In *intermedia*, as determined by Malloch, specimens were found with this character fully as conspicuous as in the types of *reticulata*. In all other distinctive characters the two are identical.

Tiphia clypeolata Malloch

1918. *Tiphia clypeolata* Malloch, Ill. Nat. Hist. Survey Bul., XIII, p. 16.
1927. *Tiphia clypeolata* Frison, Ill. Nat. Hist. Survey Bul., XVI, p. 229.

Described by Malloch from two females, Texas and Virginia, and six males of unstated locality, all cotypes. The female from Fedor, Lee County, Texas, April 28, 1919, (Banks), [Mus. Comp. Zool., "type #10,248"] is here selected as the type. This type and a paratype female from Pennington Gap, Virginia, I have examined, and consider as representing a valid species. The single paratype male, in the Illinois Natural History Survey collection,

which I have examined, does not differ in any significant character from *intermedia*, and belongs with that species. The status of the five determined males at The Museum of Comparative Zoology, probably paratypes, and the female at Urbana, Illinois, designated as paratype by Frison, though not mentioned by Malloch in his description, has not been determined.

Tiphia jaynesi new species

This species runs to *clypeolata* in Malloch's key. It very closely resembles the male of *intermedia* Mall., from which it may be distinguished by the differences in the clypeus and in the punctation of the abdominal tergites. I have been unable to separate the female satisfactorily from that of *intermedia*.

Male. Clypeus with its disk always flat; median extension without a beveled impunctate margin; lateral carina more strongly developed, in front view, than in *intermedia*, produced well beyond and concealing the lateral margin. Punctation of first tergite usually coarser than that of the intermediate tergites and preapical band wider and impunctate spot narrower than in *intermedia*. Punctures of intermediate tergites usually finer and of more uniform size and distribution than in *intermedia*, in which the punctures of the intermediate tergites are very coarse and usually as large or larger than the punctures of the first tergite. Length, 6 to 9 mm.

Type.—Male; Hartford, New Jersey. [U.S.N.M. No. 50500].

Paratypes.—All males; 3, Hartford, New Jersey, Aug. 17, 1923, (H. A. Jaynes); 3, Riverton, New Jersey, Jap. Beetle Par. Exp. 621; 2, Illinois, 1912, (G. N. Wolcott); 1, Rantoul, Illinois, 1912, (G. N. Wolcott), [all U.S.N.M.]. 3, Hartford, New Jersey, Aug. 17, 1923, (H. A. Jaynes); 3, Riverton, New Jersey, Jap. Beetle Par. Exp. 62; 71, Moorestown, New Jersey, Aug. 21, 1923, (H. A. Jaynes), (L. B. Parker), [all J.B.L.].

Other material examined: 12 ♂, Moorestown, New Jersey, Aug.; 13 ♂, Riverton, New Jersey, (Jap. Beetle Par. Exp. 32); 13 ♂ and 37 ♀, Riverton, New Jersey, (Jap. Beetle Par. Exp. 62 I); 10 ♂ and 13 ♀, Riverton, New Jersey, (Jap. Beetle Par. Exp. 62 F); 5 ♂ and 4 ♀, Riverton, New Jersey, (Jap. Beetle Par. Exp. 63 D); 4 ♀, Riverton, New Jersey; 1 ♀, (Jap. Beetle Par. Exp. 62 D); 4 ♀, (Jap. Beetle Par. Exp. 55); 1 ♀, Columbus, New Jersey, Aug., [all J.B.L.].

The females were collected at the same time and place as the males. Most of them differ from the females of *intermedia* collected from the same localities in having the transverse carina of the pronotum evenly continuous from the dorsum over the sides. In *intermedia* females from southern New Jersey the transverse pronotal carina is frequently interrupted at the humeral angle. However, this character is variable, and in many females from outside New Jersey, taken in association with *intermedia* males, the carina is high and evenly continuous, as in *jaynesi*.

Tiphia conformis Malloch

1918. *Tiphia conformis* Malloch, Ill. Nat. Hist. Survey Bul., XIII, p. 22.
1918. *Tiphia imitatrix* Malloch, Ill. Nat. Hist. Survey Bul., XIII, p. 22.
1927. *Tiphia conformis* Frison, Ill. Nat. Hist. Survey Bul., XVI, p. 229.

Malloch described *conformis* from an unstated number of cotypes including females and a male from Quincy, Illinois, designated as the type locality, and females from Falls Church, Virginia, and Brownsville, Texas. Subsequently Frison (1927) designated the male as the type. *T. imitatrix* was described from an unstated number of cotype females from Falls Church, Virginia. I have examined the type and allotype of *conformis*, in the collection of the Illinois Natural History Survey, and 3 cotype females of *imitatrix* in the collection of the Museum of Comparative Zoology. The association of sexes in *conformis*, based on the collection of a single male, taken from the type locality at the same time as the females, is not altogether certain. I was unable to recognize any significant difference in the distance between the oral opening and the back of the head, which is the single diagnostic character separating females of *conformis* and *imitatrix* mentioned in the descriptions, and find that the females of both are practically identical in all other specific characters. I consider them to be the same species.

Tiphia egregia Viereck

1906. *Tiphia egregia* Viereck, Ent. News, XVII, pp. 303, 350. (Not *egregia* as determined by Malloch.)
1918. *Tiphia tuberculata* Malloch, Ill. Nat. Hist. Survey Bul., XIII, p. 14. (Not of Cameron.)

1927. *Tiphia tuberculata* Frison, Ill. Nat. Hist. Survey Bul., XVI, p. 230.
1930. *Tiphia papillata* Roberts, Can. Ent., LXII, p. 190.

Originally described from two males from Connecticut, both collected at New Haven, the type on August 3, and the paratype August 13, 1905. Subsequently Malloch described a species found in Illinois as *tuberculata*, from a long type series of more than fifty specimens of both sexes from several localities in the state, of which a male was subsequently designated as the type. Malloch apparently associated the sexes, through collecting a large series of both at the same time and locality. Roberts recently proposed a new name, *papillata*, for Malloch's *tuberculata*, which was preoccupied by *tuberculata* Cam., an Indian species described in 1904. I have examined the types of *egregia* and *papillata*. *T. papillata* differs in having a groove on the side of the pronotum, the clypeus impunctate to its apex, and in the perceptibly wider impunctate apex of the first tergite. Since the same variations occur among the long series of paratypes of *papillata*, I do not consider them of specific rank. *T. papillata* is therefore synonymous with *egregia*, the older name. It follows that the species determined as *egregia* by Malloch, which has no sternal denticles, is a distinctly different species.

Tiphia waldenii Viereck

1906. *Tiphia waldenii* Viereck, Ent. News, XVII, p. 302.
1906. *Tiphia brunneicornis* Viereck, Ent. News, XVII, p. 303.
1918. *Tiphia waldenii* Malloch, Ill. Nat. Hist. Survey Bul., XIII, p. 23.

Malloch (1918) questioned whether this species was distinct from *floridana*. I have examined the type of *waldenii* in the Connecticut Experiment Station collection, and also a cotype of *floridana* in the collection of the Academy of Natural Sciences of Philadelphia, and find that the two species are distinct. In the male of *waldenii* there is no abnormal protuberance of the dorsal portion of the first tergite, and its preapical band is separated from the apex by the usual convex impunctate band; there is a very fine, but distinct, etched preapical line over the dorsa of all the intermediate tergites. The female, with which this male has been associated, in a series in the United States National Museum collected by C. F. Baker, (#2028 and #2029), has the following characters: The hind basitarsus is grooved; there is a

conspicuous transverse carina on the anterior dorsum of the first tergite; the pygidium is punctate on scarcely more than the basal half, with the impunctate portion scarcely more than twice as wide as long. After comparing the type of *brunneicornis* at the Connecticut Agricultural Experiment Station with that of *waldenii* I was unable to find any character which would justify calling them distinct species.

Tiphia floridana Robertson

1901. *Tiphia floridana* Robertson, Trans. Amer. Ent. Soc., xxvii, p. 195.
1918. *Tiphia floridana* Malloch, Ill. State Nat. Hist. Survey Bul., xiii, p. 23.

The cotype male in the collection of the Academy of Natural Sciences of Philadelphia and another cotype male in the United States National Museum are two of a series of three males and one female from Inverness, Florida, included in the original description. The association of sexes, which was evidently made by collecting a small series including both at the same place and time, is probably correct though open to some question, since the two sexes possess no prominent diagnostic characters in common. The male has a conspicuously elongated radial cell, much exceeding the second cubital cell, and narrowed at the apex; the dorsum of the first tergite is produced into a prominent tubercle, and the preapical band is separated from the apex by a narrow carina only; the intermediate tergites are devoid of an etched line or row of minute punctures over the dorsum. The female, of which I have seen specimens from Enterprise, Florida, and Riverton, New Jersey, has the hind basitarsus grooved; the first abdominal tergite has no antero-dorsal transverse carina; the pygidium is rugulose to the apex without any clearly defined impunctate or nonrugose apical portion.

Tiphia atlantis new species

This species runs to *tegulina* in Malloch's key but is not the same.

Female. Vertex with a broad patch of conspicuous minute punctures on posterior aspect and frequently with a few minute punctures dorsally; coarsely punctate, with impunctate spaces, laterally, as wide as ocellus. Front rather uniformly coarsely punctate without interspaces as wide as ocellus except on medial

stripe; minute punctures almost lacking. Clypeus with extension about as long as diameter of antennal fossa; its apex broadly arcuate, not bilobate, impunctate about one half distance to base of antennae, except for a row of subobsolete minute punctures extending inward from the sides; disk narrowly coarse-punctate anteriorly; lateral margin, in front view, submerged beneath the lateral carina for a short distance near base of mandibles; lateral carina short but sharply defined, not extending medially beyond outer edge of antennal fossa. Dorsum of pronotum with anterior transverse carina lacking; punctures coarse and fairly uniform, scarcely of first-degree density laterally. Side of pronotum with short irregular rugulae ventrally. Scutum with the notauli and antero-medial groove not continuous. Mesepisternum faintly shagreened, uniformly coarsely punctate with no minute and few secondary punctures on outer disk. Hind basitarsus with an elongate longitudinal groove. Tegula polished, piceous, usually with a continuous groove about the outer and posterior margin. Wing with radial cell partially enclosed by a distinct inwardly directed spur. Areola subrectangular, about twice as long as greatest width. Side of propodeum on its upper portion with fine low rugae; the lower portion glossily shagreened and obscurely setulose. First tergite coarsely punctate; the preapical band wide, not impressed, and consisting of well separated coarse punctures. First sternite with its disk flat and densely minutely punctate with large shallow primaries cephalad; without lateral grooves or posterior sulcus. Intermediate tergites coarsely deeply punctate, the punctures grouped into broad, well defined concentrations separated at the side by polished, nearly impunctate areas; the polished impunctate apex very wide, with an uninterrupted row of minute punctures on the fourth tergite well separated from adjacent coarse punctures. Pygidium with its anterior three fifths deeply rugose, without impunctate emargination of the punctate portion; the impunctate apical portion frequently black, scarcely wrinkled or shagreened. Length, 10.0 mm.

Type.—Female; New Lisbon, New Jersey. [U.S.N.M. No. 50501.]

Paratypes.—All females; 4, New Lisbon, New Jersey, May 31–June 2, 1927; 1, Pemberton, New Jersey, May 10, 1908, (G. M. Greene); 2, Jacksonville, Florida, (W. H. Ashmead), [all U.S.N.M.]. 5, New Lisbon, New Jersey, May 31–June 2, 1927; 2, (Japanese Beetle Parasite Exp. No. 328 C), 1927; 1, Langhorne, Pennsylvania, June 9, 1927, [all J.B.L.]. 1, Arizona, [A.N.S.].

This female cannot be safely associated with any of the several males collected at the same time.

Tiphia insolita new species

This species runs to couplet 16 in Malloch's key.

Male. Vertex laterally with interspaces as wide as ocellus, with sparse minute punctures on the dorsal aspect caudad to ocellar triangle. Front with punctures of first-degree density on lower half and along the eyes to the vertex, the upper medial portion sparsely punctate, with interspaces nearly as wide as an ocellus. Cheek as wide as antennal fossa. Clypeus with the median extension prominently bidentate, nearly twice as long as diameter of antennal fossa, apex upturned, narrowly impunctate, the impunctate area not exceeding one fifth the distance to base of antennae; disk perceptibly convex, polished, bipunctate; lateral margin in front view abruptly submerged and concealed for its entire length beneath the strongly developed lateral carina. Dorsum of pronotum with its anterior carina complete and strongly developed; with subobsolete punctures of third-degree density laterally, interspersed with scattered minute punctures. Side of pronotum with the anterior carina strongly produced into spinelike process, finely aciculate and vaguely rugulose across middle. Mesepisternum finely bipunctate, the minute punctures everywhere more numerous than the sparse primary punctures. Tegula polished piceous with a very fine groove continuous about the outer and posterior margins. Wings with the cubital cell equal to the radial, the apical abscissae of second cubital and radius forming a strongly zigzag line perpendicular to the costal margin. Areola with straight sides converging apically. Side of propodeum on lower portion impunctate and strongly shagreened. First tergite with a wide preapical band not deeply impressed and consisting of coarse, well separated punctures, bordered cephalad by a polished impunctate area; without transverse groove or carina; spiracles papillose and conspicuous. First sternite without well developed lateral grooves or posterior sulcus; with dense, conspicuous, minute punctures over most of disk, and shallow primary punctures cephalad. Intermediate tergites obscurely shagreened and uniformly punctate with fine subobsolete punctures; impunctate apices wide, without line of minute punctures or impressions over the dorsum. Fifth sternite laterally with a distinct transverse denticle. Length, 7 to 9 mm.

Type.—Male; New Lisbon, New Jersey. [U.S.N.M. No. 50502].

Paratype.—1 ♂, New Lisbon, New Jersey, May 31–June 2, 1927, [U.S.N.M.]; two others of the same lot, [J.B.L.].

RARE NORTH AMERICAN COLEOPTERA

BY FRANK E. BLAISDELL, SR.

Stanford Medical School and California Academy of Sciences, San Francisco, California

(Plate XXI)

The species described below are of particular interest because of their rarity. Two of the species of *Anorus* are known only by the males. A single female of *Anorus piceus* Lecont was found in 1884 and has never been described; it is wingless and of a degenerative type. A second species of *Stethorhanis* Blaisdell is known by a unique male.

Listrus vanduzeei new species (Pl. XXI, fig. 1)

Form elongate, parallel, somewhat ovate, about three times as long as wide. Color black, head and pronotum with a slight aeneous tinge; legs pale rufo-testaceous, knees and tarsi more or less piceous; antennae pale, basal and outer five joints more or less piceous. Luster feebly shining, head and pronotum somewhat opaque, surface obscured by the pubescence. The latter dense, subsquamiform and albocinereous, a broad black and transverse fascia with irregular edges at apical third, which extends part way along the suture toward apex; an oblong or oval macule at middle of each elytron and extending from base in basal seventh, a smaller macule at center of each elytron at basal fifth and mesad to each a small parasutural spot. The hairs of the fascia and macules are black centrally and brownish at the edges; basad to the fascia brownish hairs are sparsely intermixed with the whitish hairs. On the pronotum the pubescence is somewhat longer, more slender and brownish in the central area, forming an oblong figure with tripartite sides and does not quite attain the apex; laterally the hairs are whitish as on the elytra; on the head the hairs are cinereous, intermixed sparsely with fuscous hairs. Scutellum very densely albido-pubescent; beneath, on the prosternum and parapleurae dense and whitish, on the abdomen the hairs are slender and moderately dense.

Head slightly transverse, triangular in outline and the interocular surface nearly as wide as the pronotal apex. Eyes prominent, evenly convex and relatively large, facets small and short nodal setae are present. Frons plane, densely punctate, punctures and impressions obscured by the pubescence; epistoma truncate and the labrum arcuate at apex. Antennae similar in the sexes, slender, scarcely incrassate in outer seven joints; second joint oval and slightly longer than wide, third, fourth and fifth elongate, third slender and feebly obconical, fourth obconical and slightly widest before the apex; fifth a little larger than the fourth or sixth and triangulo-obconical, sixth widest at middle, as wide as long and subtriangular, seventh and eighth triangular and widest at apex, ninth and tenth larger subquadrate, as wide as long, eleventh pointed ovate, nearly as long as the preceding two combined at base as wide as the tenth; joints five to eight inclusive very feebly serrate anteriorly.

Pronotum about a third wider than long, apex truncato-arcuate in moderate circular arc; apical angles obtusely rounded and not in the least prominent; sides evenly and rather strongly arcuate in basal half, thence to apex straight and convergent, toward base rather feebly and broadly sinuate, thence continuous with the moderately arcuate base, angles absent; lateral margins finely serrulate, fimbriae short, ashy and upward and backwardly curved; disk densely indentatopunctate, evenly and somewhat strongly convex.

Elytra oblong, slightly widest at apical third, a little less than twice as long as wide; base somewhat emarginate, humeri evenly rounded and not in the least prominent; sides straight, becoming gradually arcuate and convergent to the moderately broadly rounded apex; apices slightly dehiscent, each narrowly and obtusely rounded; disk very moderately noticeably depressed in the central area, arcuately and strongly deflexed laterally, gradually declivous apically; punctation strong and obscured, punctures separated by a distance equal to one or two times their diameter.

Under surface of the body finely and rather densely punctate. Legs moderate in length and rather slender; metatarsi slightly shorter than their tibia. Abdominal segments two, three and four subequal in length.

Male. Narrower, scarcely dilated posteriorly. Antennae not incrassate in outer joints. Pronotum as wide as the elytral base. Fifth abdominal segment truncate at apex.

Female. Broader, slightly dilated posteriorly. Antennae slightly incrassate in outer five joints. Pronotal sides rather more arcuate and less sinuate posteriorly, continuing the basal arcuation. Elytral fascia broader, extending farther apically and there

at middle of each elytron divided by a reentrant line of whitish pubescence. Fifth ventral segment longer and arcuate at apex.

Measurements.—(Types) Length, 2.5 to 2.6 mm.; width, .9 to 1.1 mm.

Holotype.—♂; Jacalitos Canyon, near Coalinga, Fresno County, California. March 18, 1931. (E. P. Van Duzee.)

Allotype.—♀; taken with type.

Holotype, no. 3736 and allotype, no. 3737 in the collection of the Museum of the California Academy of Sciences.

Dascillidae

The Dascillid genus *Anorus* was established by LeConte in 1859, and based on specimens collected in the month of June at San Diego, California. The genotype is a male, the female remaining unknown until more recently. A specimen of the latter was found in 1884 and is of degenerative type, in that respect resembling members of the Elaterid Subfamily Plastocerinae. It is described below.

The generic characters are as follows, being modified from those given by Dr. Geo. Horn:

ANORUS LeConte

1859. *Anorus* Le Conte, Proc. Acad. Nat. Sci. Phila., 1859, p. 86.
1880. *Anorus* Horn, Trans. Amer. Ent. Soc., VIII, p. 85, pl. 1, fig. 3, (March).

Form elongate, moderately narrow, body fully winged in the male, functional wings absent and the elytra abbreviated in the female. In the male the antennae are slender and the intermediate segments subserrate. Mandibles prominent, acute at tip, suddenly arcuate and obtusely bidentate within the apex; margins of the scrobes acute, the lower narrowly explanate and horizontal. Front of the head strongly impressed between the antennae, the impression gradually declivous and deepest at the frontal suture. Epistoma and labrum subequal in length, short and transverse. Mentum transverse, triangular, narrowing anteriorly. Ligula membranous, with two moderately long appendages at apex; labial palpi slender, last segment longer than the preceding, maxillary palpi similar and longer. Prosternum not prolonged between the coxae, moderately long in front. Anterior coxae conical, contiguous and prominent, a large trochantin present; middle coxae oval, narrowly separated and moderately prominent, the posterior contiguous and moderately

dilated internally. Mesosternal side pieces nearly equal and, the metasternal episterna moderate in width, parallel, epimera small. Legs slender, tibial spurs distinct; tarsi moderately slender, first segment as long as the next three, third with a short lobe beneath, fourth with a deeply divided long lobe; claws slender, divaricate, onychia absent. Abdominal segments three and four equal, first, second and fifth a little longer and subequal (male).

GENOTYPE: *Anorus piceus* Leconte.

Anorus piceous LeConte (Pl. XXI, figs. 2 and 3)

1859. *Anorus piceus* Le Conte, Proc. Acad. Nat. Sci. Phila., 1859, p. 87.

Male. Form parallel (Pl. XXI, fig. 2). Color piceous, sometimes more or less testaceous. Pubescence cinereous, short, decumbent, longer and more or less flying on the appendages, pronotal apical margin fimbriate. Luster moderately shining.

Head widest across the eyes, as wide as long, mandibles not included, densely punctulate.

Pronotum twice as wide as long, apex truncate, sides arcuately narrowing anteriorly, margin simply acute; apical angles narrowly obtuse; base broadly sinuate laterally, angles obtusely rectangular; disk moderately convex, rather sparsely punctate.

Elytra a little wider than the pronotum, about six times as long as the pronotum, parallel, feebly widening posteriorly, arcuately narrowed at apex; surface substriate, vaguely serially punctate, intervals slightly convex, punctulate. Body beneath sparsely punctulate and more shining.

Measurements.—Length, 11 mm. (LeConte).

Type locality.—San Diego, California.

Distribution.—CALIFORNIA: Poway Valley, San Diego County, (F. E. Blaisdell). Lytle Creek and Oak Glen Lodge, 5000 ft. elev., San Bernardino County (F. Daggett). Palmdale, June 9, 1918, (J. O. Martin), and Sierra Madre, July 18–20, 1911, Los Angeles County. Banning, May 28, 1928, Idlewild, June 6, 1928, (E. C. Van Dyke), and Palm Springs, July, 1917, Riverside County. Waterman Canyon May 27, 1916. Soboba Springs, May 1, 1917, (E. P. Van Duzee).

Fifty-seven specimens studied. Dr. Horn states that it occurs as far north as Owens Valley, Inyo County, and that it flies at night. The writer used to find it during the day, resting on the heads of growing grain, in the grain fields at Poway. It occurs also at San Pedro Martir, Lower California (Horn).

Female. Form elongate oblong-oval (Pl. XXI, fig. 3), three times as long as wide with mandibles included. Of degenerative type, wingless, elytra abbreviated, abdomen exposed and about as long as the elytra in the type. Color testaceous, legs and sterna tinged with rufus; head and pronotum well chitinized and shining and dark rufous. Mandibles stout, very prominent and conjointly subquadrate, suddenly and subangulately arcuate, apical part transverse, each subacute at tip and bidentate within; scrobes large, subacutely margined, inferior margin narrowly and horizontally explanate, under surface plane; color piceous, paler toward base. Pubescence pale, sparse, moderately short and nearly recumbent, varying in length on the appendages and margins where it is longer and flying, most abundant on the tibiae; pronotal apical margin fimbriate laterally.

Head transverse, exclusive of the mandibles, widest across the posterior canthi; sides before the eyes short, formed by the somewhat prominent arcuate supra-antennal convexities; epistoma short, transverse and arcuate laterally, surface punctate laterally and along base, glabrous centrally at apex; labrum short and transverse, apex arcuate, from the surface arise four equidistant long setae which attain the apical margin of the mandibles when in adduction. Frons moderately convex toward vetrex, broadly and arcuately declivous laterally with the tempora; strongly, broadly and subquadrately impressed, the impression gradually declivous to the epistomal base, frontal suture distinct; surface strongly, sparsely and somewhat coarsely punctate, especially at base of the epistoma, punctures separated by a distance equal to one to three times their diameter, a small oblique and impunctate area passes inward and backward from upper part of each eye. Eyes oval in outline, entire, slightly transverse, situated well forward on the head, not in the least prominent, continuing the plane of the tempora, smooth, facets small. Antennae imperfect, inserted in front of and at upper part of the eyes; first segment moderately robust, second short, about half as long as the third, the latter, fourth and fifth elongate, subequal in length, scarcely twice as long as wide. Submentum transverse, mentum large, transverse and triangular; ligula rather deeply emarginate between the thin laminate paraglossae. Terminal segment of the maxillary palpi subcylindrical, truncate at apex and at least a third of its length longer than the third. Gular area quadrate.

Pronotum transversely oblong, about three-fourths wider than long; apex somewhat arcuato-truncate, marginal bead fine and distinct, apical angles well rounded; sides evenly and broadly arcuate, bead thin; base moderately arcuate in central two-fourths, broadly but not strongly sinuate laterally, not beaded,

angles obtusely rounded; disk evenly and rather strongly convex from side to side, finely and evenly punctate, punctures separated by a distance equal to two or three times their diameter.

Elytra quadrate, as long as wide at apex, dehiscent in apical third; base about as wide as that of the pronotum, slightly emarginate at sides of the scutellum, humeri rounded; sides nearly straight, very feebly divergent toward apex, lateral apical angles moderately rounded, thence broadly and rapidly arcuate with the sutural margin in apical third; disk depressed, feebly convex and slightly arcuately declivous laterally, sparsely, irregularly and faintly punctate. Epipleurae rapidly narrowing from base to middle of the elytra where they become obsolete. Scutellum subhastate, base truncate and margined, slightly more prominent than the elytral basal margin.

Abdomen contracted and wrinkled, pleural region well defined. Legs slender and moderate in length; femora moderately compressed, tibiae notably slender and very gradually widening to apex; tarsi and claws as in the male.

Measurements.—Length, 8 mm.; width, 3 mm.

Neallotype.—Female, in the author's collection, Museum of the California Academy of Sciences, no. 3738. The only female specimen known to me at the present time. I picked it up in Poway Valley, San Diego County in 1884. It was resting on the edge of its burrow at edge of a hard wagon road. The mouth of the burrow was perfectly cylindrical, like that of a Bostrichid in hard wood. In the type only three segments of the right and five of the left antenna remain.

In 1894 Dr. Horn described a second species from near Fort Yuma, Arizona. It may be reviewed as follows:

Anorus parvicollis Horn (Pl. XXI, fig. 5)

1894. *Anorus parvicollis* Horn, Proc. Calif. Acad. Sci., (2), IV, p. 365, (Sept. 28, 1894).

The type is yellowish testaceous in color, head rufescent and the under body somewhat piceous. The form is elongate and parallel, surface shining.

Head very sparsely punctate and clothed with long, sparse hairs; front rather strongly convex and rapidly declivous between the antennae to and somewhat impressed along the epistomal base; epistoma transverse and broadly truncato-emarginate at apex. Eyes strongly convex and prominent. Antennae long and slender; segments four to ten inclusive somewhat serrate an-

teriorly, four, five and six quite equal in length, eight, nine and ten a little longer, the eleventh elongate and slender.

Prothorax (Pl. XXI, fig. 5) nearly twice as wide as long, not broader at base; sides obtusely angulate at middle, sinuate behind the obtusely rounded apical angles and also before the rectangular basal angles, lateral edges rounded; disk evenly and moderately convex, very sparsely punctate and with long shaggy hairs arising from the punctures, base transverse.

Elytra broader than the pronotum, but scarcely wider than the head across the eyes; surface vaguely striate, slightly wrinkled near the apex, intervals with sparsely distributed short erect hairs.

Body beneath very sparsely pubescent, with the third, fourth and fifth segments of abdomen more closely pubescent in their distal half. Legs sparsely pubescent with longer flying hairs.

Measurements.—(Type) Length, 8 mm.; width, 2 mm.

Type.—Male; Fort Yuma, Arizona. [Museum of the California Academy of Sciences, no. 17.]

Parvicollis is to be differentiated from *piceus* Lec., by its pale color, angulate sides of the pronotum and the shaggy pubescence of the anterior parts of the body. A second specimen is in the general collection of the Academy, which was collected at Phoenix, Arizona.

Four specimens of an undescribed species are present in general collection of the Academy and may be defined as follows:

Anorus arizonicus new species (Pl. XXI, fig. 6)

Form elongate, narrow and parallel, four times as long as wide including the mandibles. Color piceous, slightly tinged with rufous; mouth-parts, antennae and legs moderately pale rufotestaceous, pro- and mesosternum darker, base of elytra rufopiceous. Surface more or less shining. Pubescence of head, pronotum and elytra, sparse, short and nearly recumbent; sparsely intermixed on the head and pronotum with longer flying hairs, those of the elytra more rigid and erect; the nearly recumbent hairs of the under body and legs slightly longer than those of the elytra, scattered flying hairs are present on the legs; apical border of the second and third abdominal segments densely fringed with longer soft hairs, that of the fourth much less densely so while the first and fifth segments are not fringed at apex.

Head exclusive of the eyes and mandibles quadrate, as wide as the pronotum at middle; epistoma transverse, apex arcuate, sparsely punctate, punctures strong; labrum declivous and trans-

verse; mandibles strong as usual, very acute at tip, bidentate within with molars visible at base; frons convex between the eyes, broadly flattened on vertex, tempora quite parallel, broadly declivous between the moderately prominent supra-antennal convexities and impressed along the epistomal base, very sparsely and strongly punctate, punctures more abundant on vertex becoming dense on occiput. Eyes hemispherically convex and very prominent, facets small and multitudinous. Last segment of maxillary palpi slightly widened toward apex. Pronotum (Pl. XXI, fig. 6) transverse, two-thirds wider than long, apex feebly arcuate, fimbriate; sides obtusely angulate at middle, feebly and arcuately sinuate anteriorly, angles bluntly rounded, broadly sinuate before the acute and prominent basal angles; base one-sixth wider than apex and nearly equal to width at middle, slightly arcuate in middle third, thence broadly sinuate laterally; margins sharp, beads not evident; disk feebly convex, broadly and feebly impressed at the angulations, very sparsely and irregularly punctate, punctures strong and variable in size.

Elytra two and a third times as long as wide at base, and there about a fifth wider than the pronotum, five and a third times as long as the pronotum and as wide as the head across the eyes; finely and sparsely punctate, surface slightly wrinkled, vaguely striate in apical two-thirds; sides parallel, broadly rounded at apex.

Abdominal segments two to four inclusive equal in length, intersegmental membrane well exposed; finely punctate and more or less transversely rugulose. Legs somewhat long and slender. Metatarsi two thirds as long as their tibia; first segment equal in length to that of the second and third together or that of the fourth and fifth.

Measurement.—(Type) Length, 8.5 mm.; width, 2 mm.

Holotype.—Male; Collected by J. I. Carlson at Cave Creek, Mariposa County, Arizona, June 30, 1910. [California Academy of Sciences, no. 3735.]

Paratypes.—4 ♂; Same data.

Only the male sex is known.

Arizonicus is a very distinct species. The following synoptic table is drawn up from the males only:

1. Sides of the pronotum angulate at middle; upper surface with longer flying hairs.....2
   Sides of the pronotum evenly arcuate, angles obtusely rounded; upper surface clothed with recumbent short hairs only *piceus* Leconte

2. Basal angles of pronotum rectangular, not prominent; color more or less pale . . . . . *parvicollis* Horn
Basal angles acute and prominent laterally; color piceous, base of elytra rufescent . . . . . *arizonicus*, n. sp.

Stethorhanis borealis new species (Pl. XXI, fig. 4)

Form oblong-oval, two and a half times as long as wide, surface of body glabrous and shining, color rather dark rufo-testaceous. Pubescence sparse, pale, short, rather fine, evenly distributed and very inconspicuous. Punctation very minute, scarcely larger than the base of the hairs.

Head transverse, subtriangular in outline and not quite as wide as the pronotal apex, widest across the eyes, the latter prominent and rather coarsely faceted; sides convergent anteriorly, almost straight, feebly emarginate at the oblique sutures; epistoma transverse, apex truncate; labrum transverse, apex arcuate; frons moderately and evenly convex. Antennae extending a little beyond the pronotal base, slightly longer than the width of the pronotum, moderately compressed and gradually incrassate in outer five joints; second and third joints subequal in length, each about a fourth longer than wide, fifth slightly larger and more rounded than the fourth or sixth, eighth slightly transverse, the ninth and tenth distinctly so, eleventh as long as wide, subquadrate and not wider than the tenth.

Pronotum about a third wider than long, base but slightly wider than the apex, the latter feebly arcuate, slightly and rather broadly sinuate laterally within the moderately rounded and feebly prominent angles; sides broadly and evenly arcuate in apical half, thence straight and scarcely sinuate to the rectangular basal angles; base transverse, very slightly arcuate in middle two-fourths; marginal beads very feeble, stronger at the basal angles; disk moderately and evenly convex, noticeably declivous anterolaterally, basal impressions moderately strong, bounded laterally by a carina which is equal in length to less than one-fourth that of the disk, intervening surface moderately declivous to the linear submarginal impression, the latter not noticeably bipunctate as in *vandykei*, basal margin flat, rather wide between the carinae. Scutellum transverse, apex evenly arcuate.

Elytra one-half longer than wide, widest at middle, about two and a fourth times as long as the pronotum; base transverse, scarcely wider than the pronotal base, humeri not in the least prominent; sides evenly, broadly and moderately arcuate to the individually rounded apices; surface moderately and evenly convex, arcuately declivous laterally, gradually so apically; parasutural lines fine, entire, ending against the scutellum.

Body beneath sculptured like the upper surface. Mesosternal striae fine, subparallel, arcuately converging anteriorly and united; interstrial surface broader than in *vandykei*. First abdominal segment a little longer than the three following taken together, fifth about equal to the second and third combined; third and fourth quite equal, each a little longer than the second.

Legs moderate in length, middle and posterior femora moderately clavate, the anterior somewhat inflated. Tibial spurs not discernable. Tarsi slender.

Measurements.—Length, 2.7 mm.; width, 1.1 mm.

Female unknown.

Type.—Male; British Columbia, Canada, without other data. [Author's collection, Museum of the California Academy of Sciences no. 3734].

This, the only known specimen was kindly presented to the author by Chas. Liebeck of Philadelphia, who discovered the species in his collection after the appearance of the description of *Stethorhanis vandykei* Blaisdell.[1] The paratype of the latter has been placed in Mr. Liebeck's collection.

Male and salient differential characters: Anterior tibiae moderately arcuato-angulate, with a small dentiform salient at inner apical angle; external angle moderately dilated, margin arcuate. Mesotibiae with a small chitinous spine on inner surface at apical third. Metatibiae abruptly dilated in apical two-fifths, dilated part parallel and straight on inner edge, distinctly and obtusely angulate at beginning of the dilatation.

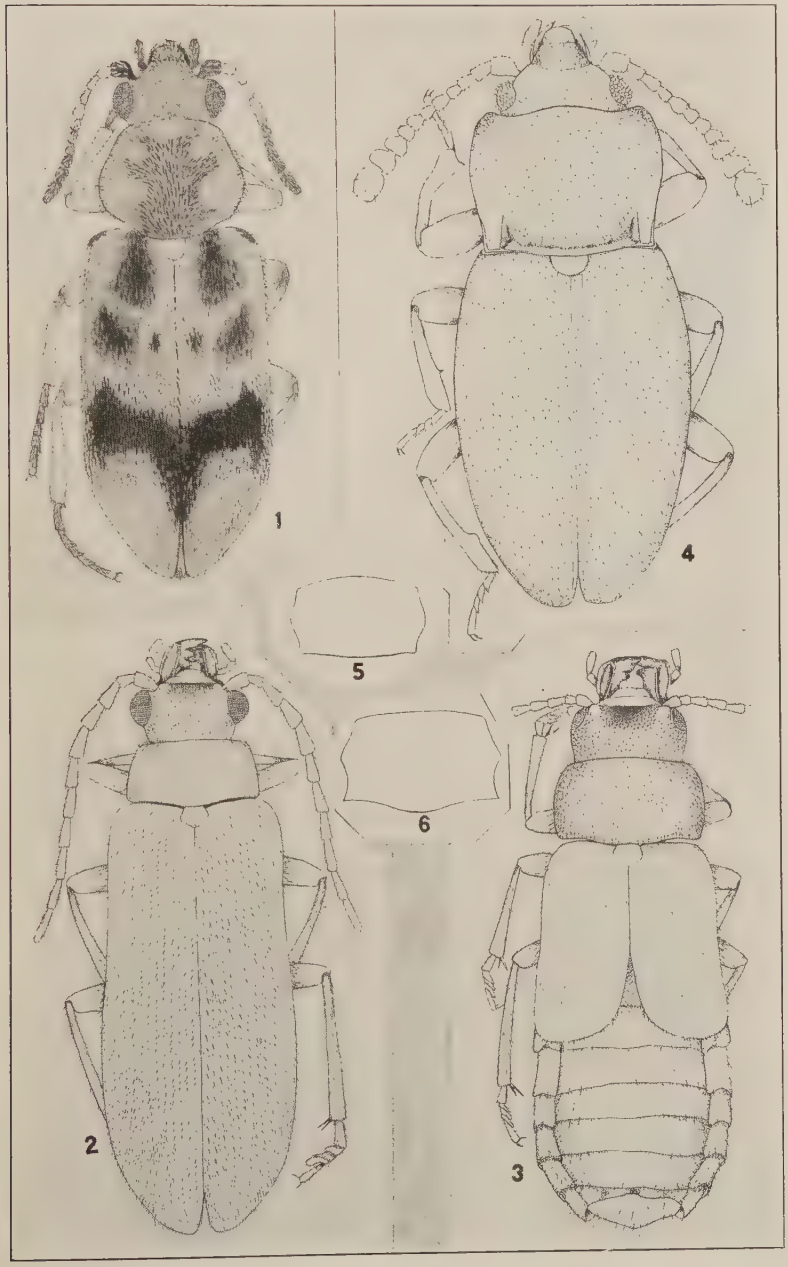
Borealis is differentiated from *vandykei* by the crural characters of the male enumerated above. In *vandykei* the middle and posterior tibiae are unmodified and simple; the anterior are slightly arcuate, feebly dilated in apical half and there is a small dentiform salient at the inner apical angle.

While reviewing the description of *Stethorhanis vandykei* Blais., an unfortunate typographical error was discovered, namely: At the beginning of the specific description it is stated that the type is "one-half longer than wide." This should read *one and a half times longer than wide.* The plate figure gives the correct proportions.

[1] Trans. Am. Ent. Soc., LVI, p. 381, (1930).

Explanation of Plate XXI

Fig. 1.—*Listrus vanduzeei* new species. Male.
Fig. 2.—*Anorus piceus* Leconte. Male.
Fig. 3.—*Anorus piceus* Leconte. Female, only known specimen.
Fig. 4.—*Stethorhanis borealis* new species. Male.
Fig. 5.—Pronotum of *Anorus parvicollis* Horn. Male.
Fig. 6.—Pronotum of *Anorus arizonicus* new species. Male.



BLAISDELL—AMERICAN COLEOPTERA

NEW SPECIES OF NORTH AMERICAN MELOIDAE
(COLEOPTERA)

PRELIMINARY PAPER

BY GUIDO G. MAYDELL *

Wilton, Connecticut

The species described in this paper are a few found while the writer was studying the species of *Epicauta* in the several collections in the eastern United States. They are here described preliminary to my contemplated revision of this coleopterous genus. Also two new species of the genus *Macrobasis* are included.

Epicauta piceiventris new species

Resembles in its general shape *puncticollis* Mann. and *oblita* Lec. but differs greatly in punctation and pubescence. As the absence of visible pubescence is unusual in the genus *Epicauta*, there arises the question whether in the four specimens before me the pubescence may have been inadvertently rubbed off. Belongs to group "A" in Horn's table and can be placed near *pruinosa* Lec.

Black, opaque, apparently without any pubescence above, but under a high power microscope and with favorable light-conditions, sparse, decumbent hairs can be seen on head, prothorax and elytra.

Head large, very densely and finely punctate, the punctures on the clypeus less dense but a little coarser; labrum with scattered punctures; between the eyes a shallow depression with the usual reddish mark; the median line fairly distinct. Antennae dark piceous; the first joint short, stout, curved, enlarged toward the apex; the second one half the length of the first; the third longer than the first two combined. Mouth parts dark piceous.

Prothorax as long as wide, convex, anterior angles broadly rounded, densely punctured; the median line deeply impressed, somewhat shining and ending in a broad, triangular depression in front of the scutellum; on either side of this depression there is a ridge close to the basal margin and parallel to it.

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* We regret to learn of the death of Mr. Maydell as this paper just goes to press. [Ed.]

Elytra elongate, parallel-sided, each with three very faint traces of longitudinal ribs.

Beneath black, somewhat shining, alutaceous, clothed with short, decumbent, piceous pubescence. Femora black; tibiae and tarsi dark piceous. Spurs of hind tibiae equal, slender, acute.

Length, 10 to 12 mm.

Type.—Male; Utah. [Museum of Comparative Zoology].

Paratypes.—Three specimens; Utah, (M.C.Z.].

Epicauta elongatocalcarata new species

Distinguished among the black species of the genus by the hind tibial spurs. In the general shape and the form of the third antennal joint resembles *piceiventris*, differs not only in respect to the spurs but in the punctation of head and prothorax, size, and pubescence of the under-surface. About the absence of visible pubescence on the upper-side the same question arises as in the preceding case. To be placed near the preceding.

Black, feebly shining, apparently without pubescence but under high magnification the more or less sparse, prostrate hairs become visible.

Head very large, nearly the same size as the prothorax, finely, not very densely punctate, the punctures being smaller than the intervals, especially on vertex and occiput; the median line distinct, impunctate, shining; between the eyes four shallow foveae, the outer ones separated from the eyes by a ridge. The labrum feebly emarginate, and with the clypeus, furnished with sparse short hairs that project forward. First joint of antennae small and enlarged toward the apex; the second, half as long as the first; the third, longer than the first two combined.

Prothorax as broad as long, arcuate toward the apex, convex; punctation the same as on the head; the distinct median line extends from the apex to beyond the middle and at this point begins a moderately deep depression that extends to the basal line; on either side of this depression close to the basal margin a transverse ridge, made the more conspicuous by shallow depressions in front; these ridges somewhat shiny because of sparser punctation.

Elytra elongate, parallel-sided, finely alutaceous; the suture rised from the scutellum to one third or less of its length.

Underside and legs granulato-punctate, sparsely clothed with decumbent, yellowish cinereous pubescence, which becomes long

and dense, fringelike, on the coxae. The spurs on the hind tibiae very long, equal in length; reaching almost to the middle of the basal tarsal joint, sticklike, truncate at tip.

Length, 15 mm.

Type.—Male? Atlanta, Idaho, 7800 ft. alt. [Museum of Comparative Zoology].

Epicauta rehni new species

From *rileyi* Horn, which this species resembles in general appearance, easily separated by the sulcate occiput and the distinctly granulated eyes. To be placed in group "B" of Horn's table near *caviceps* Horn because of the sulcate occiput.

Black, densely clothed with short, decumbent, ochreous, pubescence.

Head feebly shiny, densely but shallowly punctured. Front transversely depressed; the distinct median line runs in a longitudinal impression, which is ill defined on the front but becomes a shallow but rather broad sulcus on vertex and occiput. Eyes relatively small, emarginate in front. Antennae filiform, joints closely articulated; first, clublike; second about half as long as the first.

Prothorax as long as wide, rather subcampanulate but in the basal half parallel-sided, and in this part the sides of the convex disc are abruptly bent down, forming nearly lateral edges; the median depression distinct and deepest at the base; punctation the same as on the head and the surface also feebly shining.

Elytra elongate, parallel-sided, opaque, very finely and densely granulato-punctate.

The under surface and legs somewhat shiny, finely and densely granulato-punctate and also densely clothed with decumbent, short, ochreous pubescence. The posterior tibial spurs rather dissimilar, the outer stouter, sticklike with the tip rounded, the inner slender, bristle-like, acute.

Length, 9 to 12 mm.

Type.—Sex? Schaeffer Canon, Baboquivari Mts., Arizona, 5160–5500 ft. alt., September 18–19, 1924. (Rehn & Hebard). [Acad. Nat. Sci. Phila., no. 8184].

Paratypes.—Three specimens; topotypical, [A.N.S.P.].

Dedicated to the collector, Mr. James A. G. Rehn, of the Academy of Natural Sciences of Philadelphia.

Epicauta excavatifrons new species

Rather isolated in group "B" of Horn's table. In the sculpture of the eyes near *rileyi* Horn but differs greatly in other characters.

Black, feebly shiny, sparsely clothed with short cinereous pubescence.

Head broad, finely alutaceous, sparsely punctate. Front and part of the vertex deeply and broadly excavated, separated from the eyes by ridgelike margins; inside the excavation the punctation is reduced to scattered hair-bearing punctures and the pubescence is likewise very sparse and short; the median line very distinct, impressed, shining. Occiput feebly notched in the middle, with the posterior margin somewhat concave; as the tempora are sharply depressed, the lateral margins assume a ridglike appearence. Eyes convex, brightly shining, shallowly granulate and posteriorly bordered by a narrow, shining, impunctate area. Antennae with the joints fairly closely articulated; third joint longer than the first two combined.

Prothorax wider than long, the sides parallel for about three fourths of their length, then rather sharply narrowed toward the apex; the disc slightly convex transversely, and in front of the apex also sharply bent down, forming a kind of collar; the median line indistinct. Sculpture the same as that on the head.

Elytra parallel-sided, opaque, very finely alutaceous and indistinctly granulate; in the basal third an elongate triangular fovea anteriorly open on the suture but bordered on either side by the basal elytral margins, posteriorly terminated by a hunchlike protuberance.

The under surface shining, granulato-punctate, and pubescent as above. The hind tibial spurs subequal, slender, acute, the outer somewhat stouter.

Length, 10 mm.

Type.—Sex? Ocala, Marion County, Florida. September 19–20, 1917. (Rehn & Hebard). (Acad. Nat. Sci. Phila., no. 8183].

Paratype.—One specimen; topotypical, [A.N.S.P.].

Epicauta pacifica

This species is distinguished by the long, nearly cylindrical prothorax and can be placed near *atripilis* Champ. By the character of the antennae it is close to the genus *Macrobasis*, but as the second joint is not more than half the length of the third, it should be regarded as *Epicauta*.

Elongate, black, opaque, clothed with sparse, decumbent, black pubescence.

Head large, very densely and rather coarsely punctate. Labrum broadly but shallowly emarginate, with large and deep punctures and long bristle-like hairs. Antennae long, setaceous; first joint longer than the following two combined, enlarged toward the apex, curved at base, feebly shining, rather coarsely punctate and furnished with black pile intermixed with cinereous pile; second joint about one third the length of the first, clublike, also feebly shining and rather coarsely punctate but with its pile shorter; third joint cylindrical, about twice as long as the preceding, less shiny and with the hairs still shorter; joints four to nine subequal, cylindrical, more than twice as long as broad, opaque; the tenth a little longer and the eleventh still longer and pointed.

Prothorax nearly twice as long as wide, parallel-sided in the basal part, narrowed and arcuate before the apex; the median impression well marked and becoming fovea-like in the basal portion of the disc; punctation very dense and rather coarse; pubescence sparse and short.

Elytra elongate, subparallel, slightly enlarged toward the apex, coarsely granulate and clothed with sparse, rather long, black pubescence.

Under surface more shining than the upper; clothed with a long but sparse pubescence, which becomes very long on the legs, especially on the posterior femora. Spurs on the hind tibiae equal, rather stout and short, with the apices obliquely truncate inside.

Length, 17 mm.

Male with a single spur on the anterior tibiae.

Type.—Male; Guadalajara, Jalisco, Mexico. (?) 12, 1903. J. F. McClendon). [Mus. Comp. Zool.].

Paratypes.—2 males; Guadalajara, Mexico, July 22, 1907, (J. F. McClendon). 1 ♀ ; Tepic, Mexico, August 22, 1905, (P. H. Goldsmith). [All M.C.Z.].

Epicauta mutchleri new species

Close to *abandona* Skinner and to be placed near it, but easily separated by the shining head, the long tarsi and the shape of the posterior tibial spurs.

Slender, elongate, rufo-testaceous, with the elytra longitudinally vittate.

Head brightly shining, yellowish brown; smooth, with a few scattered fine and shallow punctures; sparsely clothed with a short, pale yellow pubescence. Median line faint on the front, but distinct on vertex and occiput. Mandibulae obtuse-bifid, longitudinally grooved and pitch-black at apex. Labrum emarginate, the clypeus furnished with scattered, large, bristle-bearing punctures and finely alutaceous. Eyes convex, emarginate, coarsely granulate. The two basal antennal joints shining, the following opaque.

Prothorax considerably longer than wide, parallel-sided for nearly three-fourths of its length from the base and then rather suddenly narrowed toward the apex; moderately densely granulato-punctate, somewhat shiny and clothed with yellow pubescence; on either side of the median line a darker longitudinal stripe, slightly curved externally, produced by absence of pubescence.

Elytra elongate, enlarged to the apex, opaque, very finely granulate and clothed with moderately dense, suberect pubescence. Two longitudinal dark pitchy-brown stripes, both starting near the base and not reaching the apex; the inner close to the suture, of equal width and shorter; the outer longer, narrow at its beginning but expanding apically; in the middle portion of the latter, parallel and rather close to it, there is an indication of a third stripe.

Under surface shining, rather sparsely punctate, yellowish pubescent. The tarsi slender and very long, on all legs considerably longer than the tibiae; hind tarsal spurs very stout, spoon-like, rounded and strongly broadened at apex.

Length, 14 mm.

Type.—Sex? Phoenix, Arizona. [Colln. Am. Mus. Nat. Hist.; erroneously identified as "abandona Skin."].

Paratypes.—Five specimens; Arizona. [Colln. Mr. William T. Davis, New York].

Dedicated to Mr. Andrew J. Mutchler, Curator of Coleoptera in the American Museum of Natural History, New-York.

Epicauta nigropilosa new species

To be placed near *carmelita* Haag, which it resembles in general appearance; easily to separate by the dense punctation and the black elytral pubescence.

Opaque, head, prothorax and under surface black; elytra testaceous, clothed with sparse, black pubescence.

Head densely and coarsely punctured and sparsely clothed with a short, dark piceous pubescence. Median line distinct; between the eyes a slight transverse depression with two small, shallow, ill defined foveae close to the middle. Eyes convex, emarginate, rather finely granulate. Labrum emarginate and with the clypeus provided with scattered, large, bristle-bearing punctures. Antennae slender and long, reaching about the middle of the elytra; first joint stout and furnished with rather long and dense black pile; second, short, subconical, with a few short black pile; third, somewhat longer than the two first combined.

Prothorax subquadrate, parallel-sided, arcuate at the very apex. Median line absent in the apical third, faint in the basal two-thirds. Punctation dense and coarse, the punctures somewhat larger than those on the head.

Elytra elongate, finely granulato-punctate; the decumbent black pubescence short and sparse; at the apical and lateral margins the hairs are longer and form a faint fringe; on each elytron indistinct traces of longitudinal ribs.

Under surface more shiny than the upper, the dark piceous or black pubescence longer, the punctation less dense. The tarsi densely spongy beneath; spurs of the hind tibiae subequal, long, sticklike, rounded at tip.

Length, 22 mm.

Type.—Sex? Guadalajara, Mexico. August 17, 1903. (McClendon). [Acad. Nat. Sci. Phila., no. 8182].

Epicauta diversipubescens new species

In its general appearence this species resembles the females of *heterodera* Horn. Can be placed before *stuarti* Lec.

Black densely clothed with testaceous pubescence.

Head densely and finely punctate, clothed with moderately dense, decumbent, pale testaceous pubescence, which becomes paler and longer on front, clypeus, labrum and in front of the eyes and also on the ventral side. Median line broad and well marked on front and vertex, faint on occiput. Maxillary palpi clothed with long, cinereous pubescence First antennal joint relatively short and stout, the second about half as long as the first, both provided sparsely with short, black pile; the third joint—the longest—nearly as long as the two proceeding combined and cinereo-pubescent; the following joints subequal with about three-fourths the length of the third.

Prothorax as long as wide, sides and disc at base feebly constricted and forming in this way a well marked basal margin, at the apex broadly rounded; the surface shining, very finely punctulate and clothed with a rather dense, testaceous pubescence; the pubescence is erect at the base, forming a marginal fringe, and rather long and decumbent at sides and apex, but on the disc it becomes fine, dense and erect, of a velvety aspect. At the apex on each side a circular black spot and between them an ill defined, arched, transverse vitta of darker pubescence, and a second pair of similar dark spots at the hind angles near the base.

Elytra opaque, finely granulate, the testaceous pubescence decumbent; close to the base on either side of the scutellum in oblong black spot.

Under surface subopaque, finely granulato-punctate and densely clothed with decumbent testaceous pubescence; the ventrals two to five with circular, black spots produced by absence of pubescence, the sixth with a small triangular mark at the apex. Femora, tibiae and the two basal tarsal joints cinereo-pubescent with the knees and tibial apices black; the spurs of hind tibiae rather unequal, the outer, stout, sticklike with a rounded tip, the inner more slender and acuminate.

Length, 10 mm.

Type.—Sex? Albuquerque, New Mexico. [Colln. C. W. Leng].

Paratypes.—Two specimens; Albuquerque, New Mexico, (labeled "Albuq., 9, 18" and "Albuq."). Two specimens; without data. [All Colln. C. W. Leng].

In two of these five beetles the basal black spots on the prothorax are absent. The black spots on the ventrals also show a tendency to vary, for two specimens have the fifth unspotted and one has two spots on this ventral; the apical mark of the sixth ventral is also not constant. Two specimens have the antennae considerably longer and more slender, probably a secondary sexual character.

Macrobasis hirsutipubescens new species

Especially distinguished by the coarse pubescence. To be placed after *virgulata* Lec., to which species it is closely allied in respect to the formation of the antennae and the anterior spurs in the male.

Black, feebly shiny, rather sparsely clothed with coarse, decumbent, cinereo-yellowish pubescence.

Head finely alutaceous, densely punctate; median line indistinct; eyes large, coarsely granulate, emarginate in front.

Prothorax longer than wide, subcampanulate, sides parallel in the basal half, slightly narrowed in the apical; median line distinctly impressed and ending at base in front of the scutellum in a long triangular depression; sculpture as on the head.

Elytra elongate, parallel-sided, less shiny than head and prothorax; black with the apices luteous; finely and densely granulato-punctate. Wings well developed.

Under surface shiny, fairly densely granulato-punctate, pubescent as above. Legs rufous, with the knees, tibial apices and partly the tarsi dark; sparsely clothed with a fine cinereous pubescence; spurs on the hind tibiae subequal, slender, acute.

Length, 9 to 11 mm.

Male. The basal antennal joint about as long as the head or the three following joints combined, slightly flattened, curved, and with a sinuate emargination apically; the second small, conical. Anterior tibiae with a single terminal spur. The basal joint of the anterior tarsi short, about one-third the length of the second, obliquely truncate and problonged apically over the insertion of the second joint.

Female: unknown.

Type.—Male; Texas. [Horn Colln., Am. Ent. Soc., no. 8181].
Paratypes.—2 ♂; Arizona, [Horn Colln., Am. Ent. Soc.].

Macrobasis maculifera new species

In general appearence very similar, besides the partly pale legs, to *Epicauta maculata* Say. To be placed near *M. purpurea* Horn.

Black, above and beneath densely cinereo-pubescent with numerous denuded round spots.

Head feebly shiny, finely and moderately densely punctate; pubescence moderately dense; median line distinct. Eyes emarginate, coarsely granulate.

Prothorax as long as wide, parallel-sided in the two basal thirds, arcuate narrowed in the apical one; median line distinctly impressed and in the middle of the disc shining; punctation and pubescence as on the head.

Elytra elongate, opaque, finely granulato-punctate. Wings well developed.

Sterna and abdomen with the structure and pubescence as on the upper side. The legs shining, moderately densely punctate and sparsely clothed with decumbent, cinereous pubescence. The front femora and tibiae piceous; the middle legs with the femora rufous and the tibiae piceous; the hind legs with femora and tibiae rufous; all coxae rufous, the tarsi piceous, the knees shining. The hind tibial spurs subequal, stout, shovel-like, obtuse at tip.

Male. The first antennal joint nearly as long as the following five combined, arcuate, thickened at apex and sinuate at the lower edge near the apex, shiny, sparsely cinereo-pubescent; the second about as long as the following two combined, arcuate, flattened and sinuate beneath, also shiny and provided with a few short, cinereous hairs; the following subequal, cylindrical, opaque; the terminal a little longer and pointed. Anterior tibiae with a single spur. The anterior tarsi with the first joint longer than the second.

Female: unknown.

Type.—Male; San Xavier, near Tucson, Arizona. July 24, 1916. [Colln. Amer. Mus. Nat. Hist.].

NEW GENERA AND SPECIES OF THE MELANOPLI FOUND WITHIN THE UNITED STATES AND CANADA

(ORTHOPTERA, ACRIDIDAE).

PARTS V AND VI

BY MORGAN HEBARD

(Plates XXII–XXVII)

Unless otherwise noted the material here studied is in the collection of the author, deposited at the Academy of Natural Sciences of Philadelphia. Duplicates of all series, however, collected jointly by Rehn and Hebard belong to that Institution.

V. THE GRACILIS, VIRIDIPES AND TRIBULUS GROUPS

Over twenty years ago the author decided upon specializing on the Group Melanopli as found in North America, and a number of papers dealing with this subject have already been published.[1] It is now realized that years must elapse before sufficient material can be assembled and studied to make the treatment of certain groups as definite and final as is already possible for the majority. The literature on certain species is highly unsatisfactory and this is particularly true of *Melanoplus viridipes* and its nearest relatives. We therefore present at this time a study of the

[1] 1917. Notes on Mexican Melanopli. *Proc. Acad. Nat. Sci. Phila.*, 1917, pp. 251–275.

1918. New Genera and Species of Melanopli found within the United States. *Trans. Amer. Ent. Soc.*, XLIV, pp. 141–169.

1919. New Genera and Species of Melanopli found within the United States. Part II. *Trans. Amer. Ent. Soc.*, XLV, pp. 257–298.

1920. New Genera and Species of Melanopli found within the United States. Part III. *Trans. Amer. Ent. Soc.*, XLVI, pp. 355–403.

1922. New Genera and Species of Melanopli found within the United States and Canada. Part IV. *Trans. Amer. Ent. Soc.*, XLVIII, pp. 49–66.

1923. An Interesting New Species of the Genus Melanoplus from Central Georgia. *Ent. News*, XXXIV, pp. 260–262.

Gracilis and Viridipes Groups and describe a new species of the Tribulus Group with a brief discussion of its relatives, based on far larger series than it has ever before been possible to assemble, (733 specimens in addition to several hundred previously correctly reported). For the loan of material, without which this work could not have been accomplished, we wish to thank most sincerely T. H. Hubbell of the University of Michigan, E. S. Thomas of the Ohio State Museum, A. N. Caudell of the United States National Museum, F. Sherman of Clemson College, N. Banks of the Museum of Comparative Zoology, W. T. Davis, B. B. Fulton, A. P. Morse and W. S. Blatchley.

During a visit to the Geneva Museum in 1927 we were able to study many of Saussure's types and his *Pezotettix longicornis*, unplaceable from the original description, is found to represent a species of the Viridipes Group, the essential characters of which are given in the present paper.

Although *gracilis* is nearer the species of the Viridipes Group than any others, we consider it the sole representative of a distinct group, distinguished by the following features.

A. Pronotum of both sexes with caudal margin transverse and usually feebly obtuse-angulate emarginate mesad. Tegmina of both sexes minute, elongate, apically rounded, widely separated, lateral pads. Meso-caudal projection of male subgenital plate greatest ventrad. Male penis an erect, stout tube terminating in two rounded triangular flaps which project horizontally and diverge latero-caudad; within the tube an extremely elongate slender flagellate paired process curves dorsad, then cephalad and tapers to an aciculate apex. Western Pennsylvania and Virginia to eastern Nebraska and Kansas; southern border of Great Lakes, southern Michigan and Minnesota to northern Alabama and Mississippi. . *Melanoplus gracilis* (Bruner)

AA. Pronotum of both sexes with caudal margin weakly obtuse-angulate produced. Tegmina of both sexes broad, rounded, subattingent to decidedly overlapping pads. Meso-caudal projection (tuberculation) of male subgenital plate, if present, dorsad. Male penis with large base bearing cephalad two slightly divergent, ear-like, erect flaps; before these and projecting from the tube are two erect, spike-like processes of less or only slightly greater length. Southwestern Vermont to southeastern Minnesota, Appalachian to Ozark Mountains as far south as northern Georgia and Arkansas.

Melanoplus viridipes and its allies.

Further studies of the penis are proving more and more conclusively that this organ can not be disregarded when considering species of the genus *Melanoplus*. In fact it would otherwise have been impossible to determine safely as distinct species or races several of those here treated. We therefore give the following key based on the characters shown by the penis, as well as figures of this organ for all of the new forms we are describing. It must be remembered, however, that external characters often distinguish many species from all others quite as safely and we believe that when such is the case they should be given precedence over features which can not be determined for individual specimens without dissection. Indeed, among the species of the Viridipes Group, the structure of the penis is so similar in *viridipes viridipes*, *viridipes eurycercus* and *longicornis* that attempt to separate these insects on the basis of characters of the penis should not be made, but they are readily distinguished by features shown by the male cerci. In other cases in this group, knowledge of the distribution of the species is of distinct assistance in locating certain of them.

Penis with a stout base.

A. This base surmounted by a pair of horizontal triangular processes directed latero-caudad. A pair of very slender attingent median processes, very elongate and whip-like, are directed dorsad and curve cephalad, then ventrad. *gracilis* Bruner

AA. This base with processes projecting vertically. The pair of median aciculate processes erect or sheathed by the pair of proximal processes.

B. The proximal processes with concave or flattened surfaces facing caudad. The median processes erect, aciculate.

C. Basal portion much less elevated caudad, so that the two pair of dorsal processes project much more conspicuously.

D. The proximal processes rounded triangular with caudal surfaces not conspicuously concave, less ear-like.

E. The proximal processes relatively small.

F. Male cercus broader, not or but feebly widened (in *viridipes viridipes* only) distad.

G. Male cercus larger, tapering but still broad distad with apex rounded. Caudal femora usually (but by no means always) heavily marked.

H. Male cercus short. New York to Michigan, south in Appalachians to North Carolina... *viridipes eurycercus* Hebard

HH. Male cercus elongate. Indiana and Minnesota south through Illinois and Iowa.....*viridipes viridipes* Scudder

GG. Male cercus small, strongly tapering, narrow distad with apex almost acute. Caudal femora never heavily marked. Ozark Mountains in Missouri and Arkansas.
sylvaticus McNeill

FF. Male cercus narrower, not strongly but distinctly widened distad. Caudal femora moderately to scarcely marked. Southern Appalachians.....*longicornis* (Saussure)

EE. The proximal processes relatively large. Eastern Kansas and northwestern Missouri.....*beameri* Hebard

DD. The proximal processes with caudal surfaces conspicuously concave, ear-like.

E1. These processes short with margins more evenly convex, projecting scarcely further than the pair of aciculate median processes. Appalachians from southern New York and northern New Jersey to North Carolina and extending westward into eastern Ohio.....*similis* Morse

EE1. These processes more elongate, projecting considerably beyond the pair of aciculate median processes.

F1. These processes with dorsal margin convex. (Male cercus distinctive, its disto-ventral angle produced in a small sharp projection.) Appalachians from Virginia southward and extending westward through southern Indiana.
hubbelli new species

FF1. These processes with dorsal margin produced in a small sharply rounded median apex. (Male cercus distinctive, its disto-ventral apex rounded.)

G. Appalachians of North Carolina. (Male cercus elongate and slender.).....*acrophilus acrophilus* new species

GG. Appalachians of Virginia. (Male cercus shorter and stout.)
acrophilus pachycercus new subspecies

CC. Basal portion much more elevated caudad so that the two pair of dorsal processes surpass it very briefly. (The proximal processes more slender than in the preceding species.) Southern Appalachians.....*deceptus* Morse

BB. The proximal processes very slender and very elongate, directed dorsad and curving outward then inward like calipers, their outer surfaces convex, their inner surfaces concave. These processes act as sheaths to the median processes which are almost as elongate and are similarly curved. Appalachians of the Carolinas.
cherokee new species

The Gracilis Group

Melanoplus gracilis (Bruner)

1876. *Pezotettix gracilis* Bruner, Canadian Ent., VIII, p. 124. [♂, ♀; Omaha, Nebraska.]

Specimens not previously recorded: 60; 31 males and 29 females.

OHIO: Richmond Bog, Huron County, VII, 1 and 2, 1932, (E. S. and J. S. Thomas), 3 ♂, 2 ♀. Huron County, IX, 15, 1929, (J. S. Hine), 9 ♂, 7 ♀. Buckeye Lake, Licking County, VIII, 18, 1932, (Thomas and Walker), 1 ♀; X, 18, 1931, (M. D. Neiswender), 1 ♂. Fairfield County, VIII, 21, 1931, (R. Goslin), 1 ♂. Jackson, IX, 10, 1929, (J. S. Hine), 2 ♀. Crissey, Lucas County, VII, 30, 1932, (R. Conant), 1 ♀. Logan County, XI, 12, 1931, (Thomas and Walker), 1 ♀. Cedar Swamp, Champaign County, IX, 4, 1932, (Thomas and Walker), 3 ♂, 3 ♀; August 24, 1930, (J. S. Hine), 2 ♀. Mud Lake, Williams County, VIII, 29, 1932, (Thomas and Walker), 1 ♀. Williams County, IX, 8, 1930, (J. S. Hine), 1 ♂. New Paris, Preble County, IX, 21, 1931, (E. S. Thomas), 1 ♂, 1 ♀. [All from Ohio State Museum].

MICHIGAN: Lakeside, Berrien County, VII, 1904, (J. L. Hancock), 1 ♂.

INDIANA: Mineral Springs, VIII, 25, 1916, (B. B. Fulton; bog swamp), 5 ♂, 1 ♀, [Fulton Cln.]. Millers, X, 10, 1903, (J. L. Hancock), 1 ♂.

ALABAMA: Marion Junction, VII, 16, 1930, (P. W. Oman), 2 ♂, [Univ. of Kansas and Hebard Cln.].

MISSISSIPPI: Iuka, VII, 14, 1930, (P. W. Oman), 1 ♂, 1 ♀.

IOWA: Elmira, VIII, 17, 1910, (M. P. Somes), 1 ♂, [Somes Cln.]. Bedford, VIII, 4, 1909, (M. P. Somes), 1 ♀, [Somes Cln.]. Mondamin, VIII, 14, 1925, (B. B. Fulton; on river bluffs), 1 ♂, [Fulton Cln.].

MISSOURI: Columbia, X, 19, 1904, 1 ♂. Willard, VIII, 1 to 8, 1919 and 1920, (A. E. Brower), 4 ♀.

NEBRASKA: Weeping Water, IX, 24, 1909, (L. Bruner), 2 ♂, 9 ♀.

This species is known north to Bloomsburg, Pennsylvania; Richmond Bog in Huron County, Crissey and Mud Lake in Williams County, Ohio; Jackson and Berrien Counties, Michigan; Mahtomedi and Redwood Falls, Minnesota, and (probably) southeastern South Dakota: west to the latter; Omaha and Weeping Water, Nebraska; Leavenworth County, Kansas; Magazine Mountain, Arkansas, and Iuka, Mississippi: south to the latter; Marion Junction, Alabama, and southeast as far as Clarksville, Tennessee, and Monterey, Virginia.

The Viridipes Group

The form of the male cerci is vastly the most important external feature in distinguishing the species of this group. Thickening of the apex of the male abdomen is weak in *similis* and our specimens of *longicornis*, very weak in *sylvaticus*, pronounced in all the other species. The male supra-anal plate averages definitely shorter in *acrophilus*, the races of *cherokee* and *deceptus* than in the other species. The apical tubercle of the male subgenital plate shows average differences in different species (weak or obsolete in *hubbelli*, our specimens of *longicornis*, *acrophilus* and *deceptus*) but individual variation is too great to give this feature much weight except in *similis* where this tubercle is distinctly transverse, broader than deep. Tegminal development is weakest in *sylvaticus*, the races of *viridipes*, *similis* and *acrophilus pachycercus*, but it is sometimes as weak in *longicornis*, the races of *acrophilus*, *cherokee* and *deceptus*. We have noted differences in coloration, but the general color pattern is similar throughout; great recession, however, distinguishes *sylvaticus* and great intensification is frequent in *viridipes eurycercus* and usual in the races of *acrophilus*, *cherokee* and *deceptus*.

Separation of females of these species and races without males is most difficult. The locality from which they come must first be considered to determine which species may occur there. Degree of tegminal development and depth of coloration alone remain as a clue toward their proper assignment.

Melanoplus sylvaticus McNeill (Pl. XXII, fig. 1)

1899. *Melanoplus sylvaticus* McNeill, Psyche, VIII, p. 345. [♂, ♀; Carroll, Boone and Newton Counties, Arkansas.]

This species was reported from along wooded cliffs and has not subsequently been recorded. It is probably widely distributed but local in the Ozark region.

Missouri: Mountain Grove, VI, 5, 1914 and VII, 1, 1915, (M. P. Somes), 1 ♂, 1 ♀. Willard, VI, 29 to VII, 11, 1919, (A. E. Brower), 37 ♂, 29 ♀. Arkansas: Ozona, VI, 11, 1932, (R. H. Beamer), 6 ♂, 5 ♀, [Univ. of Kansas].

Melanoplus viridipes eurycercus Hebard (Pl. XXII, fig. 2)

1920. *Melanoplus viridipes eurycercus* Hebard, Trans. Amer. Ent. Soc., XLVI, p. 392, pl. 16, figs. 9 and 10. [♂, ♀; type locality—Derrick City, Pennsylvania.]

This race has been repeatedly confused with typical *viridipes* in past literature.

In addition to the one hundred and thirty five specimens originally reported, the following material is now before us:

NEW YORK: Malloryville, Tompkins County, VI, 18 to 20, 1904, 1 ♀, [Cornell Univ.]. Freeville, VII, 4, 1904, 1 ♂. Caroline to Harford, VI, 15, 1904, 3 ♂, 2 ♀, [Cornell Univ. and Hebard Clns.]. Hopeoye Falls, VII, 1913, 1 ♂.

PENNSYLVANIA: Moosic Lake, VIII, 19, 1924, 1 ♀.

VIRGINIA: One and a half miles north of spring on Elliott Knob, 4000 feet, VI, 30, 1933, (H. A. Allard), 2 ♂, [U. S. N. M.].

NORTH CAROLINA: Bakersville, V, 1929, (D. A. Greene), 7 ♂, 9 ♀, [U. S. N. M.].

OHIO: Georgesville, V, 20, 1903, (C. S. Mead), 1 ♂, 1 ♀.[2] Clifton, Green County, VI, 24, 1903, 2 ♂, 2 ♀. Xenia, V, 30, 1903, (C. S. Mead), 1 ♀.

MICHIGAN: Montmorency County, VII, 14, 1923, (T. H. Hubbell), 5 ♂, [Univ. of Michigan and Hebard Clns.].[3] Otsego County, VII, 11 to 14, 1923, (T. H. Hubbell), 7 ♂, 6 ♀, [Univ. of Michigan and Hebard Clns.].[3]

Atypical *viridipes eurycercus*

MICHIGAN: Lakeside, Berrien County, VI, 21 to VII, 13, 1903 and 1904, (J. L. Hancock), 3 ♂, 6 ♀.

The race *viridipes eurycercus* is known to occur typical north to St. Albans, Vermont; Slaterville, Groton and Cattaraugus County, New York; Kendall State Park in Summit County, Hanover Township in Ashland County and Salem Township in Champaign County, Ohio,[4] and Montmorency and Otsego Counties, Michigan: west to the latter and Marion County, Indiana: south to the latter; Cincinnati, Ohio, and Bakersville, North Carolina; east to the latter, Elliott Knob and Sounding Knob, Virginia; Moosic Lake, Pennsylvania; Great Barrington and North Adams, Massachusetts, and St. Albans, Vermont. Its distribution probably also includes nearly all of Kentucky.

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[2] Reported as *viridipes* by Mead from Franklin and Highland Counties. Ohio Nat., IV, p. 110, (1904).

[3] It is surprising that these series are typical of *viridipes eurycercus*, as material from southern Michigan and most of Indiana is intermediate to varying degrees between this race and *viridipes viridipes*.

[4] These northern limits have been furnished us through the kindness of E. R. Thomas, who has assembled a large series of this race from Ohio.

Melanoplus viridipes viridipes Scudder (Pl. XXII, fig. 3)

1891. *Pezotettix viridulus* McNeill, Psyche, VI, p. 75. (Nomen nudum.) [Normal and Bloomington, Illinois.]

1897. *Melanoplus viridipes* Scudder, Proc. U. S. Nat. Mus., XX, p. 255, pl. 17, fig. 4. [♂, ♀: Rock Island, Moline, Ogle County and Riviere de Parc, Illinois; Vigo County, Indiana.[5]]

1897. *Melanoplus juvencus* Scudder, Proc. U. S. Nat. Mus., XX, p. 266, pl. 18, fig. 1. (No locality for male type; see Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1916, p. 212.)

The assignment by Blatchley in his "Orthoptera of North-Eastern America," p. 367, 1920, of *deceptus* and *similis* to synonymy under *viridipes* only shows how glaringly superficial was both his knowledge and treatment of the group. Had his field work been done in any but a casual manner he would certainly at least have recognized in Indiana the presence of two very distinct species.

Bruner reported *viridipes* in 1897 from along the Missouri River in Nebraska, but no such material is in the Bruner Collection, and we believe that, like several others, this name has no place on the Nebraska list.

In this species the male cerci vary from two and a third to three times as long as the proximal width. The distal half of the cercus is conspicuously narrower than in *viridipes eurycercus*, while the majority show to different degrees a weak distal broadening which is never developed in the eastern race.

As only a few measurements have been given for this race, the following have been taken.

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[5] Material from this locality had been reported as *viridulus* and *viridipes* by Blatchley in 1892 and 1894. Examination of the series shows that it includes material of typical *viridipes*, atypical *viridipes viridipes* and also the species here described as *hubbelli*. Morse recognized the fact that a distinct species was represented in the series but referred that material to his *deceptus* at the time of original description, so that in the series of *hubbelli* from Vigo County, Indiana, there are specimens which are paratypes of both *viridipes viridipes* and *deceptus*.

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Length of caudal femur
Lafayette, Indiana.	18.5	4.1	2.3	5.7	10.
St. Joseph, Illinois.	17.	3.8	2.3	5.	9.3
Dubois, Illinois.	17.5	4.	2.4	5.6	9.7
Moline, Illinois.	17.5–18.	4.–4.2	2.4–2.5	4.5–4.9	9.3–9.6
Monticello, Iowa.	17.5	4.	2.3	5.1	9.
♀					
Homer, Illinois.	25.	5.	3.5	7.	12.3
Dubois, Illinois.	23.5	5.	3.4	5.	11.7
Muncie, Illinois.	23.–25.7	4.8–5.1	3.2–3.7	5.4–7.	11.2–11.9
Moline, Illinois.	21.5	5.2	3.4	6.5	11.2
Normal, Illinois.	21.5	5.	3.4	5.6	11.8

This race has the caudal femora averaging paler with bands narrower than in *viridipes eurycercus*. In no case do the two bands fuse on the ventral margin of the pagina of the caudal femora, as frequently occurs in the eastern race. In all the males the subgenital plate is shining black except for a narrow buffy crescent, the base of which is formed by the junction of this plate with the preceding sternite. That sternite is bordered with black proximad, laterad and distad, the internal margin of this marking along the distal margin convex so that the border is narrowest laterad. The two preceding sternites are suffused with black proximad.

We have recently studied large series of this race from Illinois, the data for which are appearing in a paper on the Orthoptera of that State.*

Specimens not previously recorded:

Wisconsin: Merrill, VII, 1 and 3, 1933, (Frison and Mohr), 2 ♂.
Minnesota: St. Anthony Park, VI, 1890, 1 ♀.
Indiana: Tremont, VI, 9, 1929, 1 ♂.

This race is known to occur typical north to Merrill, Wisconsin, and Sunrise, Minnesota: west to St. Anthony Park, Minnesota, and Monticello, Iowa; south to the latter locality and Pulaski, Illinois: east to Vigo County and Lafayette, Indiana.

* Ill. Nat. Hist. Surv. Bull., xx, p. 192, (1934).

Intergradation with *viridipes eurycercus* occurs in parts of southern Michigan, Wisconsin and most of Indiana. To varying degrees always atypical in central and northern Indiana and southern Michigan, it is surprising to find the species atypical in Polk County in northwestern Wisconsin and typical of the eastern race, *viridipes eurycercus*, in the northern portion of the Lower Peninsula of Michigan.

Melanoplus beameri Hebard (Pl. XXII, figs. 4 and 5; pl. XXIII, fig. 4; pl. XXVII, fig. 1)

1931. *Melanoplus beameri* Hebard, Proc. Acad. Nat. Sci. Phila., LXXXIII, p. 175, text figs. 1 and 2. [♂, ♀: Leavenworth County, Kansas, and Kansas City, Missouri.]

This insect apparently supplants *viridipes viridipes* in western Missouri and eastern Kansas. No material from central or eastern Missouri is as yet available to enable us to decide whether or not it is a western race of that species. It may indeed prove to be a western race of *similis*, which insect typically has very different appearing male cerci, but in one male of *similis* from West Point, New York, a very definite approach toward the cercal type normal in *beameri* is shown. The cercal variation in *similis* is discussed under that species.

Melanoplus similis Morse (Pl. XXII, figs. 6, 7 and 8; pl. XXVII, fig. 2)

1904. *Melanoplus similis* Morse, Researches in North American Acrid., Carnegie Mus. Wash., Publ. 18, p. 47, text fig. 6. [♂, ♀; Murphy, North Carolina.]

1920. *Melanoplus calloplus* Hebard, Trans. Amer. Ent. Soc., XLVI, p. 398, pl. 16, figs. 13 and 14. [♂, ♀; type locality—Collison Ridge, Bath County, Virginia.]

At the time we described *calloplus* the original description and figure of *similis* alone were available. Examination of the original series of *similis* has subsequently shown that the latter is very inaccurate and that our material unquestionably represents the same species.

In frequent males the degree of convexity of the dorso-caudal angle of the cercus is variable, giving the apex a much less truncate appearance than usual when that convexity is greatest. Such is particularly prominent in one male from West Point, New York, where much closer than usual resemblance to the cercus of some

specimens of the western *beameri* results; the latter species, however, having the cercus tapering in all but its distal third instead of tapering in only the proximal half or slightly less. Another male from Mount Sterling, North Carolina, has the distal portions of the cercus unusually narrow, but this we believe is also attributable wholly to individual variation. It is therefore evident that the male cerci are subject to some individual variation in the present species and the same we find to be true for the other species of the group. Although the form of the male cerci is the most important feature in distinguishing the species and although such variation occurs in probably all of the species, we are satisfied that, though the separation of the species and races is thereby made very difficult, sufficient series will always show whether individual variation, racial or specific status is actually indicated.

The apical tubercle of the male subgenital plate is slightly transverse, frequently dimpled, and in two specimens of the large series before us it is distinctly bituberculate. Such differences are wholly attributable to individual variation.

The caudal femora have the dark markings often rather broad in the males but never fusing ventrad. These markings individually vary from weak and diffused to almost obsolete in the females.

The male subgenital plate is blackish except in the narrow subchitinous basal portion, the preceding sternite being pale with distal portion alone blackish, which forms a very narrow transverse triangular marking.

In addition to the twenty nine specimens we originally recorded as *calloplus*, from West Point, New York; Plainfield, New Jersey; Collison Ridge and Snickers Gap, Virginia; White Sulphur Springs, West Virginia, and Mayland, Tennessee, the following material is now before us:

North Carolina: Mount Sterling, Haywood County, 3000 feet, VII, 31, 1924, (T. H. Hubbell), 1 ♂, 1 ♀. Crestmont, Haywood County, 2200 to 3000 feet, VII, 27 and 29, 1922, (T. H. Hubbell), 2 ♂, 3 ♀. [All Univ. of Michigan Cln.].

Ohio: Wills Township, Guernsey County, VI, 28, 1931, (C. F. Walker), 1 ♀. Fallsburg, Licking County, VI, 18, 1932, (Walker and Handel), 1 ♀. Greenfield Township, Fairfield County, VI, 18, 1931, (C. Goslin), 1 ♂. Lancaster, VII, 4, 1930, 2 ♂. Athens, VI, 8 to VII, 17, 1932, (Thomas and Stehr), 24 ♂, 14 ♀. Harrison Township, Vinton County, VII, 11, 1931, (E. S. Thomas), 1 ♂. Jackson Township, Jackson County, VII, 11, 1931,

(E. S. Thomas), 4 ♂, 3 ♀. Washington Township, Jackson County, VII, 11, 1933, (C. F. Walker), 2 ♂, 3 ♀. Madison Township, Jackson County, VI, 25, 1932, (Thomas and Stehr), 11 ♂, 2 ♀. Fort Hill, Highland County, VI, 26 and VII, 22, 1933, (E. S. Thomas), 3 ♂, 2 ♀. Jaybird, Adams County, VI, 18, 1933, (E. S. Thomas), 1 ♂. [All Ohio State Mus.].

TENNESSEE: Allardt, Fentress County, 1600 feet, VI, 10 to VII, 19, 1924 and 1925, (T. H. Hubbell; only two females after June 11), 59 ♂, 44 ♀, 2 juv. ♀. Clark Range, Fentress County, VII, 21, 1924, (T. H. Hubbell), 1 ♂. Grassy Cove, Cumberland County, 1700 to 2000 feet, VII, 8 to 12, 1922, (T. H. Hubbell), 4 ♂, 3 ♀. Clear Fork near Burrville, Morgan County, VI, 12, 1924, (T. H. Hubbell), 1 ♂.

The range of this species is now known to extend east to West Point, New York; Plainfield, New Jersey; Collison Ridge and Snickers Gap, Virginia, and Crestmont and Murphy, North Carolina. In Ohio it is known only from the southeastern third of the State, not extending its range beyond the limits of glaciation, Guernsey County and Fallsburg being northern limits, the latter and Fort Hill western limits. Southward *similis* probably continues through the hills and mountains to the west of the main Appalachians to its present known southwestern limit, Cumberland County, Tennessee. It is therefore very evident that the insect inhabits very extensive areas in the mountains of Pennsylvania, West Virginia and Kentucky where it has not as yet been secured. Those regions have not yet been collected in nearly sufficiently; moreover the present species is not only alert and active but also local and sylvan, while adults appear in the late spring and early summer, largely if not wholly disappearing in the fall when the majority of grasshoppers are at their peak of seasonal abundance and most field work is done.

Melanoplus longicornis (Saussure) (Pl. XXII, figs. 9 and 10)

1861. *Pez[otettix] longicornis* Saussure, Rev. et Mag. de Zool., XIII, p. 159, [♂; [South] Carolina.]

1916. *Melanoplus similis* Rehn and Hebard (not of Morse, 1904), (in part). Proc. Acad. Nat. Sci. Philadelphia, 1916, p. 210. [♂ only; Rabun Bald and Clayton, Georgia.]

The name *longicornis* long remained unidentifiable, due to the complete insufficiency of the original description. Examination of the type at the Geneva Museum by the author in 1927 showed it to represent a species of the Viridipes Group, nearest *similis* of

the described forms. It occupies a position between that species and *hubbelli* here described.

Lack of sufficient material and the unsatisfactory character of the descriptions and figures of *deceptus* and *similis* brought about our incorrect determinations of 1916 and the author's description in 1920 of *calloplus* (a synonym of *similis*).

Saussure's type is dried from immersion in alcohol. The caudal femora have the genicular areas dark, a short dorsal dark suffusion preceding them, this preceded by another smaller suffusion continued narrowly and obliquely on the external pagina and terminating mesad near its base. The tegmina are attingent, rather sharply rounded distad and slightly shorter than the pronotum. The male cerci are more slender and decidedly less truncate than in the type of *similis* as the dorso-distal angle rounds very broadly, with apical portion more elongate. The tubercle of the subgenital plate is very blunt. All but the base of the subgenital plate is dark and all of the preceding sternite is dark except for a large transverse rectangular area.

The two other males which we believe are referable to *longicornis* differ from the type in having the tegmina longer than the pronotum and fully as elongate as is normal in *hubbelli*, while in these the subgenital plate shows no tuberculation. We hardly believe that racial status is indicated, but more material must be secured before the significance of such differences can be satisfactorily determined.

The male cerci in *longicornis* are very much more attenuate than is normal in any other eastern species of the group, with distal portion scarcely broadened and disto-dorsal angle showing the broadest convexity.

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Length of caudal femur
Rabun Bald, Georgia.	17.8	4.6	2.6	5.9	9.8
Clayton, Georgia.	18.	4.3	2.4	6.	9.8

The only fresh material we refer here is the following.

GEORGIA: Rabun Bald, VII, 1910, (W. T. Davis), 1 ♂, [Davis Cln.]. Clayton, 2000 to 3700 feet, (W. T. Davis), 1 ♂, [Hebard Cln.].

Melanoplus hubbelli new species (Pl. XXII, fig. 11; pl. XXVII, fig. 3)

1897. *Melanoplus viridipes* Scudder (in part), Proc. U. S. Nat. Mus., xx, p. 255. [♂, ♀; Vigo County, Indiana.]

1903. *Melanoplus viridipes* Blatchley (in part not of Scudder, 1897), Orth. of Indiana, p. 305. [♂, ♀; Vigo County, Indiana.]

1904. *Melanoplus deceptus* Morse (in part), Psyche, xi, p. 9. [♂; Indiana and Vigo County, Indiana; Jasper, Georgia at 2600 feet.]

1916. (probably) *Melanoplus similis* Rehn and Hebard (not of Morse, 1904), Proc. Acad. Nat. Sci. Philadelphia, 1916, p. 211. [♀ only: Bluemont, Virginia; Clayton and Tuckoluge Creek, Georgia.]

1916. *Melanoplus deceptus* Rehn and Hebard (in part not of Morse, 1904), Proc. Acad. Nat. Sci. Philadelphia, 1916, p. 212. [♂; Clayton, Georgia.]

1920. *Melanoplus viridipes* Blatchley (in part not of Scudder, 1897), Orth. of North-Eastern America, p. 365. [♂; Vigo County, Indiana; Jasper, Georgia.]

Morse recognized that Scudder and Blatchley had confused two species in their material from Vigo County, Indiana, but insufficiency of material prevented his realizing that his male specimen from Jasper, Georgia, represented one of those species and not *deceptus* which he was describing from Jones' Peak, Balsam Mountains, North Carolina.

Blatchley's attempt to place all of these species as synonyms of *viridipes* in 1920 indicates wholly unjustified undervaluation of male cercal characters, such possibly due to the fact that his series of *viridipes* showed decided variation in the male cerci as all of it came from Indiana in the area of intergradation between *viridipes viridipes* and *viridipes eurycercus*.[6]

This species is nearer *deceptus* than any of those already treated. The tegmina are proportionately larger and more ample (excepting in *longicornis*) and the male cerci are distinctive, with disto-dorsal portion roundly elevated and the disto-ventral angle produced as a small tooth. The male subgenital plate either entirely lacks an apical tubercle or has a very low bluntly rounded apex.

Type.—♂; Red Hills, Franklin County, Ohio. July 14, 1931. (E. S. Thomas). [Hebard Collection, Type no. 1258].

Size medium, form graceful for the brachypterous Melanopli. Fastigium of vertex and frontal costa shallowly but definitely

[6] See Hebard, Trans. Amer. Ent. Soc., xlvi, p. 392, (1920).

sulcate. Antennae elongate, as long as the caudal femur. Eye prominent, very slightly longer than cheek. Pronotum with medio-longitudinal carina distinct on metanotum (elsewhere obsolete in type, very feeble in occasional individuals), caudal margin of disk very weakly rounded obtuse-angulate produced. Tegmina ample, overlapping, definitely longer than pronotum, apices broadly rounded, dorsal and lateral fields weakly defined but distinguishable. Prosternal spine small, blunt conical. Furcula represented by two small blunt projections. Supra-anal plate distinctly longer than broad, triangularly shield-shaped, a pair of heavy medio-longitudinal carinae present proximad, followed by the distal slightly raised area, the lateral margins of which are formed by much weaker and more rounded short longitudinal carinae, often with a short longitudinal carina inside the lateral margins opposite the cercal bases. Cercus almost two and one-fifth times as long as proximal width, curving gently inward, tapering strongly in proximal half due to the declivity and slight concavity of the dorsal margin; shaft mesad slender, less than half as wide as proximad; slightly over distal third enlarged, moderately flattened, its dorsal margin convex produced, the disto-ventral angle produced in a minute acute tooth; ventral margin of cercus nearly straight. Subgenital plate small, apex rounded (often slightly elevated, rarely definitely forming a low blunt tubercle).

Allotype.— ♀ ; same data as type. [Hebard Collection].

Much larger and more robust than male with eyes less prominent. Sulcation of vertex and frontal costa much weaker than in that sex. Amplitude of tegmina (usually) even more conspicuous than in male. Prosternal spine shorter and heavier. Ovipositor valves moderately elongate, curvature at apices moderate.

Coloration generally brown, a broad shining blackish postocular band extending to abdomen. Ventral portions of pronotal lateral lobes brownish buff, ventral portions of face slightly darker. Cephalic and median limbs light brownish, in life possibly always yellow green, this richer in males than in females. Caudal femora with characteristic dark markings of group often diffused and extensive, never intensive, but often running together ventrad in males; these markings weaker, often obsolete in dried females. The male subgenital plate is blackish except for the narrow subchitinous proximal buffy area, the preceding sternite blackish except for a very large transverse rectangular buffy area.

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Length of caudal femur
Red Hills, Ohio.	18.6–19.7	4.3–4.6	2.6–2.8	5.3–5.7	10.–10.8
Vigo County, Indiana.	15.7–18.2	4.2–4.9	2.7–2.8	5.3–6.7	9.3–10.7
Allardt, Tennessee.	17.7–20.	4.8–4.9	2.7–2.9	6.1–7.	10.8–10.9
Clayton, Georgia.	20.7	5.	2.9	6.6	10.8
Jasper, Georgia.	19.8	5.2	3.1	6.7	11.1
♀					
Bluemont, Virginia.	24.	5.7	3.8	7.3	12.2
Red Hills, Ohio.	22.2–25.	5.2–5.7	3.7–3.9	5.9–6.9	10.8–12.3
Hocking County, Ohio.	21.	5.8	3.9	6.7	11.8
Vigo County, Indiana.	20.8–23.7	5.8–5.7	3.8–3.8	5.8–6.3	10.8–11.4
Allardt, Tennessee.	22.3–24.	5.6–5.8	3.7–3.9	6.–6.8	11.3–12.6
Tuckoluge Creek, Georgia.	26.5–26.7	5.9–6.2	3.6–3.9	7.5–7.5	11.8–12.8
Clayton, Georgia.	26.	5.5	3.6	7.5	11.8

Southern specimens of this species are larger and more graceful than any others.

Though yet known from few localities, this local, sylvan species is seen to have a wide distribution and will certainly be found over very extensive areas in southwestern Pennsylvania and most of West Virginia, Kentucky and Tennessee. It is known north to the Catoctin Mountains, Maryland; the Red Hills in Franklin County, Ohio, and Vigo County, Indiana; east to Bluemont, Virginia; Rocky Bottom, South Carolina, and Clayton, Georgia; south to Jasper, Georgia. Southwestern limits can not be defined.

Specimens Examined: 86; 41 males and 45 females.

Maryland: Catoctin Mountains near Thurmont, VII, 4, 1933, (H. A. Allard), 1 ♂, 2 ♀, [U. S. N. M. and Hebard Cln.].

Virginia: Bluemont, VII, 1, 1914, (J. D. Hood), 1 ♀, [Hebard Cln.].

South Carolina: Rocky Bottom, Pickens County, V, 31 to VII, 4, 1932 and 1933, (F. Sherman), 6 ♂, 13 ♀, [Sherman and Hebard Clns.]. Jocassee, VII, 4, 1931, (J. A. Berly), 1 ♀.

Ohio: Red Hills, Blendon Township, Franklin County, VI, 13 to VII, 17, 1931 to 1933, (Thomas and Walker; in rather open second growth woodland with a xeric south exposure on hills, undergrowth of *Aster*, *Anychia*, *Phlox*, Pennyroyal, *Nabalus;* much more sluggish and easy to capture than the very alert *similis*), 22 ♂, 17 ♀, *type*, *allotype* and *paratypes*. Good Hope Township, Hocking County, V, 30 to VI, 9, 1932 and 1934, (Thomas and Walker; in second growth oak and chestnut woodland with an extremely xeric south

exposure), 2 ♂, 4 ♀. Cedar Falls, Hocking County, VII, 4, 1932, (Thomas and Walker; one specimen only found in a mixed mesophytic forest), 1 ♂. [All from Ohio State Museum].

TENNESSEE: Allardt, Fentress County, 1600 feet, VI, 10 to 13, 1924 and 1925, (T. H. Hubbell), 4 ♂, 2 ♀, [Univ. of Michigan]. La Follette, Cumberland Mountain, Campbell County, VI, 10, 1934, (R. G. Goslin), 3 ♂, [Ohio State Mus.].

GEORGIA: Tuckoluge Creek, Rabun County, VI, 1909, (W. T. Davis), 2 ♀, [Davis and Hebard Clns.]. Clayton, VI, 1909, (W. T. Davis), 1 ♂, 1 ♀, [Hebard Cln.]. Jasper, 2600 feet, VII, 26, 1903, (A. P. Morse), 1 ♂, [Mus. Comp. Zool.].

INDIANA: Vigo County, part VI, 8, 1893, (W. S. Blatchley), 6 ♂, 2 ♀, [Blatchley, Mus. Comp. Zool. and Hebard Clns.].

Melanoplus acrophilus acrophilus new species (Pl. XXII, fig. 12; pl. XXIII, fig. 5; pl. XXVII, fig. 4)

1916. *Melanoplus deceptus* Rehn and Hebard (in part, not of Morse, 1904), Proc. Acad. Nat. Sci. Philadelphia, 1916, p. 212. [♂, ♀; Black Mountain, North Carolina.]

This is an extremely interesting species as it approaches *deceptus* closely in general appearance and has cerci approaching those of that insect more nearly than those of any of the preceding forms, though they are decidedly less highly specialized, but the penis is very distinct, of the general type found in the preceding species and nearest that of *hubbelli* here described.

Comparison with *cherokee* here described shows that, without examination of the penis, these species are apparently indistinguishable, although the specialization of that organ in *cherokee* is remarkably distinctive and wholly unlike that of any other species of the Viridipes Group.

Type.—♂; Black Mountain, North Carolina. June, 1912. (Wm. Beutenmüller). [Hebard Collection, Type no. 1257].

Generally very similar to *viridipes*. Tegmina slightly longer than pronotum. Tergite preceding supra-anal plate not (rarely moderately) swollen at point where furcula (present in rare specimens and then very minute) would be. Supra-anal plate shorter than in *viridipes*, as in *deceptus*, no longer than broad, the lateral margins very faintly convex, contour much as here described for *hubbelli*. Cercus about two and one-half times proximal width, curved decidedly inward, tapering in proximal third (to two-fifths in paratypes) due to the declivity and slight concavity there of the dorsal margin, shaft mesad over half proximal width, distal half (to very slightly more in paratypes)

moderately (weakly to moderately decidedly in series) enlarged, the dorsal margin there convex and rounding to the subrectangulate and sharply rounded disto-ventral angle, the ventral margin very broadly and very feebly concave, almost straight. Apical enlarged portion of cercus conspicuously longer and narrower than in *hubbelli*. From the stout base of the penis spring two pairs of erect ear-like lobes, each of which is longer than broad with caudal surface concave, the dorso-external portion of the caudal pair with a small projection curling caudad; at the inner bases of these are two small adjacent erect aciculate projections which are considerably shorter than the lobes (see plate B, figure 5). Subgenital plate small, rounded, with a stout, moderately blunt, apical tubercle.

Allotype.— ♀ ; same data as type. [Hebard Collection].

Indistinguishable from females of *cherokee* and *deceptus*. Tegmina slightly longer than pronotum, but their exposed portions appear no longer. Ovipositor valves as here described for *hubbelli*.

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Length of caudal femur
Black Mountain, North Carolina.	18.–19.	4.3–4.7	2.7–2.7	5.–5.8	10.1–10.3
Mount Mitchell, North Carolina.	15.7–16.7	3.7–3.9	2.1–2.3	4.8–4.7	8.7–8.7
Mount Graybeard, North Carolina.	16.7	4.6	2.7	5.	9.4
Grandfather Mountain, North Carolina.	18.1	4.4	2.7	5.2	10.
♀					
Black Mountain, North Carolina.	21.7–24.	5.–5.4	3.3–3.6	5.4–6.7	10.8–11.8
Mount Graybeard, North Carolina.	19.6–21.2	5.–5.2	3.2–3.3	5.6–5.3	10.3–10.5
Grandfather Mountain, North Carolina.	22.–22.7	5.2–5.3	3.4–3.7	5.2–5.8	10.8–11.1

General coloration as characteristic for the group but rich and very intensive. Post-ocular band shining black, very broad, not paling caudad on pronotum. Pronotum with ventral portions of lateral lobes buffy, the post-ocular dark band sometimes margined narrowly dorsad with dull buffy. Cephalic and median limbs light brown, often with the femora weakly, the tibiae strongly

tinged with green. Caudal femora so intensively colored that they are black, with two bands (oblique and extending only over dorsal half of external pagina), a pre-genicular annulus and a ventro-external line in proximal half of buffy, the ventral surface buffy often suffused with greenish glaucous externally and meso-distad. Caudal tibiae greenish glaucous with a post-proximal buff annulus, before (strongly) and after (weakly) suffused with brown. All of the greenish coloration is apparently lost when specimens of this group become discolored and in the females which were not eviscerated the color pattern of the caudal femora is often partly or wholly lost.

Specimens Examined: 21; 13 males and 8 females.

North Carolina: Hawkshill Mountain, Burke County, 3600 feet, V, 24, 1934, (F. Harper), 1 ♂, [A. N. S. P.]. Black Mountain, VI and VII, 1912, (W. Beutenmüller), 2 ♂, 3 ♀, *type*, *allotype* and *paratypes*, [Davis and Hebard Clns.]. Mount Mitchell, above 5000 feet, V, 20, 1928, (F. Sherman), 6 ♂, [Sherman, Hebard and U. S. N. M. Clns.]. Mount Graybeard, V, 1923, (N. Banks), 3 ♂, 2 ♀, [Mus. Comp. Zool. and Hebard Clns.]. Grandfather Mountain, VII, 8, 1928, (B. B. Fulton; in shrubby spot on southeast slope between Blowing Rock and Linville at about 4000 feet), 1 ♂, 3 ♀, [Fulton and Hebard Clns.].

Melanoplus acrophilus pachycercus new subspecies (Pl. XXII, fig. 13)

Serious discoloration has occurred in the series before us, but the insect is very similar to typical *acrophilus* in general appearance, differing only in being very slightly stockier and in having distinctive male cerci.

It is probably similarly an inhabitant of mountain forest undergrowth and very local in distribution. Material from the mountains between the type locality, which is the northernmost point known for the species, and southwestern North Carolina, will, we believe, show intergradation and prove the present to be a northern geographic race.

Type.—♂; Mountain Lake, Giles County, Virginia. Elevation about 4000 feet. July 18, 1915. (P. P. Calvert). [Acad. Nat. Sci. Phila., Type no. 5537].

Generally very similar to the type of typical *acrophilus*. Tergite preceding supra-anal plate swollen at bases of the very minute, triangular furcula. Supra-anal plate as here described for *cherokee* but all carinae coarse and very weak. Cercus slightly more than twice as long as proximal width, curved decidedly inward, tapering moderately in proximal half due to the declivity

of the dorsal margin, shaft mesad thick and over half proximal width, distal half moderately enlarged, the dorsal margin there broadly convex to the sub-rectangulate and rather blunt disto-ventral angle, ventral margin of cercus broadly concave. Compared with that of *cherokee* the cercus is seen to be shorter and broader with apical enlarged portion proportionately more extensive and disto-dorsad with its margin more oblique-declivent to the disto-ventral apex. Subgenital plate small, with a stout blunt apical tubercle.

Allotype.— ♀ ; same data as type. [Acad. Nat. Sci. Phila.].

Indistinguishable from females of typical *acrophilus* (except that the tegmina in the series average shorter). The shorter tegmina make females almost impossible to distinguish from this sex of *viridipes eurycercus*.

The extremes in the present series measure as follows. Length of body ♂ 17. and 17.2, ♀ 19.5 and 22.3; length of pronotum ♂ 4.7 and 4.4, ♀ 4.7 and 4.8; caudal width of pronotal disk ♂ 2.7 and 2.7, ♀ 3.4 and 3.3; length of tegmen ♂ 4.7 and 4.8, ♀ 4.6 and 5.2; length of caudal femur ♂ 8.7 and 8.9, ♀ 9.7 and 10.8 mm.

In addition to the type and allotype, two male and three female paratypes and a male in the instar preceding maturity, bear the same data except that they were taken from the 17th to the 26th of July.

Melanoplus deceptus Morse (Pl. XXII, fig. 14; pl. XXIII, fig. 6)

1904. *Melanoplus deceptus* Morse (in part), Psyche, xi, p. 9. [♂, ♀; Jones' Peak, Balsam Mountains, North Carolina.]

1910. *Melanoplus deceptus* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1910, p. 633. [♂, Tennessee.]

Morse originally included in his original series of *deceptus* specimens from Vigo County, Indiana and Jasper, Georgia, which represent a distinct species, here described as *hubbelli*. In addition, the figure of the cercus which Morse published later in 1904 is very badly drawn and foreshortened to such a degree that recognition of typical *deceptus* has been almost impossible. This situation led to the assignment to *deceptus* of material of *cherokee* here described from Black Mountain, North Carolina, and of *hubbelli* here described from Clayton, Georgia, by Rehn and Hebard in 1916.

The size, form and coloration of *deceptus* agree fully with *cherokee* as here described.

Close agreement with the type is shown by all of the males of *deceptus* in the distinctive form of the cercus. It is about two and one-half times as long as its proximal width, curved decidedly (moderately in one paratype only) inward, tapering decidedly in proximal two-fifths due to the strong declivity and concavity of the dorsal margin, the shaft mesad over one-half its proximal width, then strongly enlarging in the distal three-fifths, its dorsal margin mesad deeply concave in consequence, thence broadly convex declivent to the decidedly subrectangulate (sharply rounded to acute) disto-ventral angle, ventral margin of cercus nearly straight (sometimes very feebly convex to distal portion, in Siler's Bald and "Tennessee" males feebly concave in distal portion only). Subgenital plate with a prominent apical tubercle in all but one paratype, in which that tubercle is stouter and blunt.

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Length of caudal femur
Crestmont, North Carolina.	17.7	4.2	2.4	5.4	10.
Jones' Peak, North Carolina.	15.5–16.2	4.5–4	2.6–2.7	5.2–4.8	8.8–8.9
Sunburst, North Carolina.	18.5	4.7	2.7	6.1	10.2
Siler's Bald, Tennessee.	15.5	3.9	2.4	5.2	9.
Tennessee.	18.3	4.	2.6	5.7	—
♀					
Jones' Peak, North Carolina.	21.8–23.	5.–5.	3.8–3.7	6.4–6.	11.1–10.8

The following 23 males and 12 females have not been previously correctly reported.

South Carolina: River Falls, VI, 7, 1932, (M. B. Stevenson), 1 ♂, [Brimley Cln.]. Caesar's Head, VI, 29, 1926 and V, 3, 1928, (J. A. Berly and F. Sherman), 2 ♂, 1 ♀, [Hebard Cln. and U. S. N. M.]. Sassafras Mountain, Pickens County, V, 31, 1933, (O. L. Cartwright), 1 ♂. Rocky Bottom, Pickens County, VIII, 16, 1929, (F. Sherman), 1 ♂.

North Carolina: Crestmont, Great Smoky Mountains, 4000 feet, VII, 29, 1922, (T. H. Hubbell), 1 ♂, [Univ. of Michigan]. Sunburst, Haywood County, late V, 4 ♂, 3 ♀; 3500 to 5000 feet, VI, 14, 1924, (all C. S. Brimley), 12 ♂, 7 ♀, [North Carolina State and Hebard Clns.].

Tennessee: Siler's Bald, Great Smoky Mountains, 5700 feet, VII, 31, 1910, 1 ♂.

Georgia: Rabun Bald, VI, 16, 1924, (H. Fox), 1 ♀.[7]

[7] Without males we can not determine whether this female should be referred to the present species or to *cherokee*.

Melanoplus cherokee new species (Pl. XXII, fig. 15; pl. XXIII, fig. 7)

This species, like the races of *acrophilus* here described, could easily be mistaken for a race of *deceptus* were the penis not examined, which in the present case is very widely different from that of any of the other members of the Viridipes Group.

In appearance and structure, even of the male genitalia, close resemblance is shown to *acrophilus* and the student is warned that mistakes in identification are certain to occur if the pallium is not removed from above the penis in males so that the latter can be examined. We have not been able to find anything by which females of these species can be distinguished.

Like *acrophilus* and *deceptus* the insect is unquestionably sylvan, local and restricted in distribution to the southern Appalachian Mountains.

Type.—Crestmont; Great Smoky Mountains, North Carolina. Elevation 3200 feet. July 21, 1922. (T. H. Hubbell). [Univ. of Michigan].

Closely similar to *acrophilus* here described, agreeing in all features here given except the penis. This in the present insect has the lobes greatly narrowed, erect, curving evenly outward and then inward so that they almost meet at their extremities, the more caudal pair chitinized and with their caudal surfaces transversely convex so that they conceal and act as outer sheaths for the more cephalic pair.

The following much less significant differences from the type of *acrophilus* are shown by the present type. Cercus about two and three-quarters times proximal width, tapering in proximal third, distal three-fifths weakly enlarged. Apical enlarged portion of cercus much longer than in *hubbelli*. Subgenital plate with a stout blunt apical tubercle (which is less blunt in two paratypes).

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Length of caudal femur
Rocky Bottom, South Carolina.	19.2	4.9	2.7	5.7	10.7
Mt. Sterling, North Carolina. 5100 ft.	16.	4.1	2.3	6.2	9.7
Crestmont, North Carolina. 3200 ft.	17.3	4.2	2.6	5.7	9.7
Crestmont, North Carolina. 1800 ft.	17.8	4.3	2.7	5.8	10.2

	♀				
Rocky Bottom, South Carolina.	25.3	5.3	3.3	6.2	12.2
Crestmont, North Carolina. 3200 ft.	22.4	4.9	3.6	5.8	10.8
Crestmont, North Carolina. 3000 ft.	21.3	4.8	3.6	5.9	12.

Specimens Examined: 9; 6 males and 3 females.

South Carolina: Rocky Bottom, Pickens County, 3500 feet, VI, 1, 1933, 1 ♂; VI, 21, 1933 and VI, 22, 1932, 1 ♂, 1 ♀, (all F. Sherman), [Sherman Cln.].

North Carolina: Mount Sterling, Great Smoky Mountains, 5100 feet, VIII, 2, 1924, (T. H. Hubbell), 1 ♂, *paratype*, [Univ. of Mich.]. Crestmont, Great Smoky Mountains, 1800 to 4200 feet, VII, 18 to 29, 1922 and 1924, (T. H. Hubbell), 4 ♂, 2 ♀, *type*, *allotype* and *paratypes*, [Univ. of Mich. and Hebard Clns.].

The Tribulus Group.

We have recently decided that *obovatipennis* Blatchley is nothing more than a race of *rusticus* (Stål). Examination of topotypes of *tribulus* Morse and a paratype of *devius* Morse in the author's collection now show that the latter is a synonym of the former, but that the species which has usually been recorded in the literature as *tribulus* is actually a distinct undescribed species here named *delaware*. In addition, a paratype of *tribuloides* Morse in the author's collection is found to have a very different penis from that of *tribulus* or *delaware* and is not a race of *trubulus* as was indicated by Blatchley in 1920.

The species belonging to the present group we arrange in the following sequence: *tepidus* Morse, *morsei* Blatchley, *rusticus obovatipennis* Blatchley, *rusticus rusticus* (Stål), *delaware* here described, *tribuloides* Morse, *tribulus* Morse and *decoratus* Morse.

Melanoplus delaware new species (Pl. XXII, fig. 16; pl. XXIII, figs. 1 and 8)

This species has been recorded as *tribulus* from Clove Valley, Reeds Valley, Graniteville, Lambert's Lane, Watchogue and Richmond, New York (Davis); Ramapo Mountains, Ramsey, Barnegat, Reega, Belleplain, Sea Isle Junction, Dennisville, Dias Creek (Fox) and Stafford's Forge (Rehn and Hebard), New Jersey; Pink Hill, Pennsylvania (Rehn and Hebard); Beltsville and Plummer's Island, Maryland (Rehn and Hebard); Pohick (Rehn and Hebard) and Wingina (Davis) Virginia; Weldon,

North Carolina (Rehn and Hebard); Clayton, Rabun County and Lost Mountain, Georgia (Rehn and Hebard).[8]

The following features are shared by *delaware* and its nearest allies. Pronotum with a fine percurrent medio-longitudinal carina. Tegmina pad-like, rounded, separated by a slight to decided interval, conspicuously shorter than the pronotum. Male subgenital plate with a small but decided blunt subapical tubercle, the dorsal surface of which is darkened. Limbs showing no trace of green.

These species may be distinguished as follows:

A. Male furcula very small, scarcely longer than proximal width. Penis with four large erect lamellate plates cephalad and curling cephalad like flower petals, yoke of shaft slightly produced and bluntly rounded dorso-caudad, leaving a meso-caudal interspace (Pl. XXIII, fig. 8). (Female normal. Vertex less projecting. Pronotal lateral lobes and ovipositor jaws less deep. Broad postocular dark bar sharply outlined on pronotal lateral lobes. The insect appears adult earlier than *tribulus* in the regions where the distribution of the two coincide.) Extreme southern New York and northern New Jersey to mountains of extreme northeastern Georgia..... *delaware* new species

AA. Male furcula small, but considerably longer than proximal width (Pl. XXIII, figs. 2 and 3). Penis lacking large lamellate plates.

B. Penis with four small lamellate plates directed cephalad at apex, yoke of shaft with caudal margins rounding broadly ventrad, leaving a meso-caudal interspace (Pl. XXIII, fig. 9). Female as in *delaware* but with pronotum deeper. Mountains of northeastern Alabama... *tribuloides* Morse

BB. Penis terminating in a flat knob, with four very small projections caudad, yoke of shaft with caudal margins attingent, produced dorsad as small rounded projections (Pl. XXIII, fig. 10). Female heavier with more projecting vertex, pronotal lateral lobes and ovipositor jaws deeper and broad postocular dark bar (usually) less sharply outlined on pronotal lateral lobes. (Appears adult late in season.) Collison Ridge in mountains of central-

[8] The records from Toccoa, Dalton, Jasper, Sharp Mountain, Buckhead and near Stone Mountain were, however, correctly referred to *tribulus*. We now realize that *delaware* extends its distribution into the lowlands only in the northern portion of its distribution, while *tribulus* does this only in the southern portion of its range. In addition the former species appears much earlier in the season than the latter.

western Virginia south to Spartanburg, South Carolina and Atlanta and Dalton, Georgia.....*tribulus* Morse

Type.—♂; Flag Rock Pass, Warm Springs Mountain, Bath County, Virginia. Elevation 2900 feet. July 6, 1916. (M. Hebard). [Hebard Collection Type no. 1263].

Size slightly below medium, form graceful. Vertex narrow, concave between the distinct lateral carinae; frontal costa depressed only around median ocellus. Pronotum with a very fine percurrent medio-longitudinal carina, principal sulcus alone distinct on dorsum, caudal margin convex on each side leaving a very small median angulate emargination. Prosternal spine rather slenderly conical and sharply rounded at apex. Tegmina ovate, shorter than pronotum, separated by a distinct interval. Apex of abdomen definitely thickened. Furcula very small, springing from thickened areas on tergite, very slightly longer than basal width with rounded apices. Supra-anal plate shield-shaped, medio-longitudinal sulcus percurrent, lateral portions concave, paired distal carinae short prominent and divergent cephalad. Cercus elongate, shaft slender, apical portion as broad as base with disto-dorsal margin broadly rounded and disto-ventral portion moderately produced disto-ventrad and bluntly rounded acute-angulate. Penis as given in above key. Subgenital plate with a small but sharply defined blunt subapical tubercle.

Allotype.—♀; same data as type. [Hebard Collection].

Larger and more robust than male, but the contrast between the sexes is decidedly less than in *tribulus*. Vertex broader. Prosternal spine heavier but with apex as sharply rounded. Tegmina even shorter in proportion to pronotal length. Ovipositor jaws medium, with moderate distal curvature, dorso-external margins of dorsal valves toothed.

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Length of caudal femur
Ramapo Hills, New Jersey.	19.	4.7	2.9	4.2	10.8
Staffords Forge, New Jersey.	17.8	4.3	2.7	3.2	9.8
Flag Rock, Virginia.	17.–18.	4.3–4.4	2.6–2.7	2.9–3.2	9.8–10.2
Mountain City, Georgia.	18.8	4.4	2.7	3.4	10.
♀					
Woodbridge, Connecticut.	23.3	5.	3.7	3.7	11.3
Staffords Forge, New Jersey.	23.7	5.3	3.8	4.	11.7
Plummers Island, Maryland	25.8	5.8	4.6	4.8	12.2
Flag Rock, Virginia.	19.8–23.3	4.8–5.3	3.7–4.	4.–4.7	10.7–11.7
Mountain City, Georgia.	22.7	5.1	3.8	4.	11.3

Generally dark brown, a broad postocular shining black band present which is sharply defined and widens caudad on the pronotal lateral lobes. Face, genae and ventral portions of pronotal lateral lobes brownish buff, often clear buff. Limbs brown. Caudal femora with dorsal surface often showing weakly a suffused transverse median band and distal suffusion, the paler portions in some series often tawn; ventral surface buff with a yellowish tinge. Sides of abdomen with blackish patches decreasing and weakening in intensity caudad. Ventral surface buff.

This is the only short-winged woodland species of *Melanoplus* known from New Jersey and eastern Pennsylvania. It is extremely local, widely distributed through the hilly woodlands of northern New Jersey and in favorable spots in the Pine Barrens. In eastern Pennsylvania it occurs much less frequently. At Pink Hill the few specimens secured were found among scanty grasses and plants growing on the poor soil of a serpentine outcrop near the edge of a deciduous forest. Only at the type locality have we found the species sufficiently abundant so that a series could be taken without long and intensive search, even after a colony had been located.

The following previously unreported 81 males, 92 females and 9 immature individuals are before us.

CONNECTICUT: Woodbridge, VIII, 20 and 30, 1896, 2 ♀.

NEW JERSEY: Stafford's Forge, VII, 21 and 29, 1915, (M. Hebard; in undergrowth of pine barrens where small oaks were present; very local, long intensive search necessary to obtain series), 5 ♂, 19 ♀, 2 juv. ♂, 5 juv. ♀.

MARYLAND: Plummer's Island, X, 13, 1918, (M. Hebard; undergrowth of deciduous forest), 1 ♀, (unusually large).

VIRGINIA: Round Hill, VII, 14, 1916, (J. D. Hood), 1 ♂, 1 ♀. Rest, VIII, 25, 1906, (M. Hebard; occasional in open deciduous forest), 2 ♂, 1 ♀. Two miles east of Covington, 1000 to 1300 feet, VIII, 16, 1906, (M. Hebard; in weeds and short grasses on hillside), 2 ♂, 4 ♀. Flag Rock Pass, Warm Springs Mountain, 2900 to 3000 feet, VII, 4 to VIII, 2, 1906, (M. Hebard; locally in very large colonies in short herbage of open area on mountain), 63 ♂, 56 ♀, *type*, *allotype*, *paratypes*, 2 juv. ♀ (VII, 4). Hot Springs, 1800 feet, VII, 6, 1916, (M. Hebard; on shaly hillside in huckleberry and other bushes), 2 ♂. Deer Lick Mountain, Little Mountain Ridge, 2800 feet, VII, 10, 1916, (M. Hebard; very few in undergrowth of deciduous forest), 1 ♂, 4 ♀. Dunn's Gap, VIII, 20, 1916, (M. Hebard; in low dry forest undergrowth), 1 ♀.

SOUTH CAROLINA: Pickens, VI, 24, 1932, (F. Sherman), 1 ♂, 1 ♀. Rocky Bottom, VI, 26, 1934, (F. Sherman), 1 ♀.

GEORGIA: Mountain City,[9] VI, 14 to 17, 1924, (H. Fox), 4 ♂, 1 ♀.

[9] The specimen from Wilson Gap near this locality, recorded as *devius* by Rehn and Hebard in 1916, actually represents *delaware*.

VI. THE LEPIDUS, FEMUR-NIGRUM, ARTEMISIAE AND MONTANUS GROUPS

The above western groups of *Melanoplus* were known to us to include species which had not been described. Six new species are treated in the present paper.

The penis had not been studied for any of the species and has been found to furnish characters of the greater importance. This is particularly true for the species of the Montanus Group, where it was possible to state definitely that *washingtonius*, *repetinus* and *oreophilus* were distinct species and not races only after each was known to have a strikingly distinctive penis.[10]

The Lepidus Group

To this group we now refer *olamentke* Hebard, *solitudinis* here described, *lepidus* Scudder and *ablutus* Scudder. Of these *olamentke* and *solitudinis* are clearly nearly related but quite widely distinct from the other two species, which are themselves widely distinct in certain characters but show agreement to different degrees in many features.

Following this group is the Saltator Group in which we have placed first the very aberrant *bernardinae* Hebard. Below we show that in two features of male genitalia *solitudinis* agrees more closely with that insect than with any of the other species of either of these groups.

The first two species of the succeeding group, the Femur-nigrum Group, are *femur-nigrum* Scudder and *snowii* Scudder, and these again have certain features in common with some of the species of the Lepidus Group and the Saltator Group.

Melanoplus olamentke Hebard (Pl. XXIV, figs. 1 and 2)

1897. *Melanoplus olamentke* Hebard, Trans. Amer. Ent. Soc., XLVI, p. 391, pl. 17, fig. 11. [♂; southern portion of Sonoma County, California.]

This interesting insect is still known only from the two originally described males. We here figure the penis.

[10] The importance of the concealed male genitalia must in many cases, however, not be overemphasized. Thus all of the species of the Femur-nigrum Group are readily separable by external characters quite as striking as the great differences of the penis which each also shows.

It is further noteworthy that the structure of the penis would often be actually misleading in associating species, as in some species of unquestionably close relationship a wholly differently developed penis is found to exist.

Melanoplus solitudinis new species (Pl. XXIV, figs. 3, 4 and 5)

This distinctive insect inhabits the undergrowth of the conifer forests of the Markagunt and Paunsagunt Plateaus in southern Utah.

Compared with *olamentke* Hebard, males of this species are found to agree closely in general structure, coloration and color pattern, differing in the very weak or absent medio-longitudinal carina of the pronotal disk, slightly longer and less tapering furcula, supra-anal plate with more convex lateral margins which show a marked thickened elevation just before the cercal apices (in this feature and the inbent cercal apices somewhat recalling the otherwise very distinct *bernardinae* Hebard), cerci with apical portions shorter, broader, inbent and with external surfaces more strongly impressed and penis with proximal processes not nearly as tubular and others more acute.

Type.—♂; Bryce, Paunsagunt Plateau, Utah. Elevation 8200 feet. August 30, 1926. (Rehn and Hebard). [Hebard Collection, Type no. 1264].

Size and form medium (size varying considerably in response to conditions of immediate environment but not to altitude). Vertex narrow, concave between the distinct lateral carinae; frontal costa showing very weak blunt lateral carinae and extensive but weak impression about the median ocellus. Pronotal disk with fine medio-longitudinal carina present on metazona but absent on prozona, sulci distinct but fine on dorsum, caudal margin of disk obtuse-angulate produced with apex rounded. Prosternal spine moderately elongate, distad rather slender with apex bluntly rounded. Tegmina broad lanceolate with apices sharply rounded, narrowly overlapping, length distinctly less than that of pronotum (but individually variable to slightly longer than that dimension). Apex of abdomen conspicuously thickened. Furcula a minute pair of rounded projections springing from moderately thickened areas of the tergite, slightly longer than basal width. Supra-anal plate rather broadly shield-shaped but longer than broad, medio-longitudinal sulcus very broad and strong to median point, much weaker in distal portion, lateral portions strongly concave, lateral margins showing rounded thickening just before cercal apices, a trace of a very short transverse carina opposite these at extremity of the deeper portion of the medio-longitudinal sulcus; paired short disto-lateral carinae prominent, parallel. Cercus short, shaft stout, proximal half narrowing moderately due to the concave declivity of the dorsal margin; distal half enlarging to become almost as broad as the

base, its dorsal margin concave ascendant then rounding without angulation and becoming convex to the disto-ventral angle, which is rounded subrectangulate; ventral margin almost straight, showing some concavity above dorso-proximal angle of subgenital plate (or broadly and shallowly concave); distal portion (which is sometimes slightly less than half of cercus) definitely bent inward with external surface prominently impressed. Penis with lateral margins of stout shaft meeting dorso-caudad without projections to form a narrow cleft, proximal processes erect and tubularly enfolding the first pair of central projections which project briefly beyond them and have their subchitinous apices with external margins curving to the sharp dorso-internal subrectangulate apex, the second pair of central projections protecting the basal portions of these as erect elongate flat shafts with rounded apices reaching dorsad as far as the lateral enfolding sections. Subgenital plate broad, terminating at dorso-distal margin mesad in a transverse rounded and slightly projecting apex (this individually varying from almost sharply conical and not transverse to a pair of low rounded projections).

Allotype.— ♀ ; same data as type. [Hebard Collection].

Considerably larger and more robust than male. Vertex broader with carinae and impressions of it and frontal costa weaker. Prosternal spine considerably stouter with blunt apex. Tegmina shorter in proportion to pronotal length (but individually also varying to slightly longer than pronotum and occasionally attingent or subattingent only at widest point), dorsal and lateral fields weakly defined. Ovipositor apices rather short and stout, dorsal pair strongly curved, with dorso-external margins bluntly toothed and two transverse rows of blunt teeth on dorsal surface, ventral apices less strongly curved.

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Length of caudal femur
Red Canyon. 6700 feet.	18.	4.1	2.7	4.	9.8
Bryce. 8200 feet.	16.8–18.8	4.2–4.6	2.3–2.7	2.9–5.3	9.–10.
Near Midway. 9700 feet.	18.–20.3	5.–5.2	2.8–3.	5.–5.8	10.3–10.4
Duck Creek. 9900 feet.	17.3	4.9	2.8	5.7	10.3
Cedar Breaks. 10400 feet.	17.3–20.8	4.3–5.2	2.6–3.3	4.8–6.7	9.5–11.7
♀					
Red Canyon. 6700 feet.	19.	4.8	3.1	5.3	10.8
Bryce. 8200 feet.	17.7–20.3	4.–4.8	2.7–3.2	4.9–6.	9.8–10.7
Near Midway. 9700 feet.	19.7–27.3	4.8–6.	3.–4.3	5.8–7.3	10.8–12.8
Duck Creek. 9900 feet.	20.–23.7	4.8–5.4	3.–3.8	5.3–6.8	10.7–11.5
Cedar Breaks. 10400 feet.	20.6–22.	5.–5.2	3.–3.4	5.3–5.8	9.9–11.3

Though it is true that the size average optimum is reached in this species at from 9000 to 10400 feet and that series from lower elevations all average smaller, it is clear that conditions of immediate environment often produce very great individual size differences.

Generally dark brown, in pale brown individuals often with markings all recessive. A very dark postocular bar present but extending caudad only to principal sulcus on pronotal lateral lobes, this frequently flanked with buffy dorsad on occiput and proximal portion of prozona, very rarely interrupted by an oblique buffy fleck on the cephalic portion of the pronotal lateral lobes. Occiput and pronotal disk sometimes weakly tinged with reddish, sometimes with olivaceous. Tegmina the same, or occasionally paler dorsad, or occasionally darker laterad and then sometimes with flecks of paler there. Dorsal surface of abdomen buffy or light reddish brown, the sides with dark areas which decrease in size caudad. Cerci weakly and subgenital plate narrowly suffused with brown at apices, this rarely extending to the lateral margins of the latter and dorsal margins of the preceding sternite in intensive individuals. Underparts buffy. Limbs individually brown, reddish buff or buff; caudal femora with two broad oblique bands and apices dark brown, the first band forming a V on the external pagina and often fusing ventrad with the second band, ventro-external margin and ventral surface buff or yellowish tinged with dragons blood red internally (usual in series from Paunsagunt Plateau) or dragons blood red with intervening sulcus and basal and apical annulus yellowish or buff (in series from Markagunt Plateau). Caudal tibiae usually rich glaucous, rarely pale glaucous, but pink in pair from Red Canyon, seven males and seven females from Bryce and two males and one female from Cedar Breaks. Such dimorphism in the brachypterous species of the genus is found only in some of the species of a few groups.[11]

The present species is known from the following series of seventy-seven specimens.

Utah: Bryce, Paunsagunt Plateau, 8200 feet, VIII, 29 and 30, 1926, (Rehn, Hebard and Farrar; series taken only after long search in Black Sage and Antelope Brush, *Purshia tridentata*, on flat surface of plateau under Western Yellow Pines, *Pinus ponderosa*), 16 ♂, 15 ♀, *type*, *allotype*, *paratypes*. Red Canyon near western base of Paunsagunt Plateau, 6700 feet, VIII, 30,

[11] It will be probably found in *olamentke* Hebard of the present group and is known in *saltator* Scudder and *ascensus* Scudder of the Saltator Group, while dichromatism of a different character in the caudal tibiae occurs in a number of species of the Femur-nigrum Group.

1926, (Rehn and Hebard; very scarce under Western Yellow Pines and at foot of rock slides where neither Black Sage or Antelope Brush was present), 1 ♂, 1 ♀. Markagunt Plateau, 8300 feet, VIII, 30, 1926, (M. Hebard; in Western Yellow Pine forest), 1 ♂. Duck Creek, Markagunt Plateau, 9000 feet, VIII, 30, 1926, (Rehn and Hebard; one on flat of short grass with no other Orthoptera, others on edge of conifer forest), 3 ♂, 5 ♀, 1 juv. ♀. Five miles east of Midway, Markagunt Plateau, 9700 feet, VIII, 31, 1926, (Rehn and Hebard; Hudsonian Zone, moderately common in high dry grass under clumps of thickly growing pines), 9 ♂, 14 ♀. Cedar Breaks, Markagunt Plateau, 10400 feet, VIII, 31, 1926, (Rehn and Hebard; not common in a single glade of Hudsonian Zone herbage, the majority in one small area of a species of dandelion), 7 ♂, 4 ♀.

Melanoplus lepidus Scudder

1897. *Melanoplus rileyanus* Scudder (in part), Proc. U. S. Nat. Mus., xx, p. 152. [♀; Yuba County and mountains near Lake Tahoe, California.]
1897. *Melanoplus lepidus* Scudder, Proc. U. S. Nat. Mus., xx, p. 321, pl. 21, fig. 9. [♂, ♀; Humboldt River, Nevada; mountains near Lake Tahoe and Truckee (type locality), California.]

Four paratypes are in the author's collection. The following material shows the range of the species to extend far northward.

Oregon: Hood River, 200 to 500 feet, VIII, 18, 1910, (Rehn and Hebard), 1 ♀; IX, 21, 1897, (A. P. Morse), 5 ♂, 3 ♀, [Mus. Comp. Zool. and Hebard Clns.].

California: Sugar Hill, Goose Lake, 5300 feet, VIII, 24, 1922, (Rehn and Hebard; locally in moderate numbers in chaparral and mats of ground chinquapin under Western Yellow Pines, *Pinus ponderosa*), 12 ♂, 13 ♀. Tahoe, 6300 to 7000 feet, VIII, 30, 1910, (Rehn and Hebard; scarce in conifer forest with chaparral and areas of a mullen-like plant, *Rhamnus tomentella*), 2 ♂, 4 ♀; 7500 feet, VIII, 8, 1930, (E. R. Tinkham), 1 ♂. Blue Canyon, Placer County, 4700 to 5000 feet, VIII, 29, 1910, (Rehn and Hebard; few on open hillsides covered with clumps of high green bushes), 3 ♂, 4 ♀, 1 juv. ♀. Colfax, 2450 to 2800 feet, VIII, 27, 1910, (Rehn and Hebard; common on hillsides with scattered trees and much poison oak and chaparral, particularly in *Chamaebatia foliosa*), 24 ♂, 20 ♀, 1 juv. ♀.

In color individuals range from very dark with sharply defined color pattern to pale buffy brown with color pattern almost obliterated.

Melanoplus ablutus Scudder

1899. *Melanoplus ablutus* Scudder, Proc. Davenport Acad. Nat. Sci., viii, p. 185, pl. 8, fig. 3. [♂, ♀; Wawona, California.]
1909. *Melanoplus ablutus* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1909, p. 471. [♂; El Portal, California, at 2050 feet.]

The pair of small but striking tubercles or short transverse high lamellae mesad on the male supra-anal plate constitute a feature distinguishing this species and *lepidus* Scudder from their allies.

The male cerci are much more extensively spatulate distad in *ablutus*, and the two erect proximal processes of the penis are ear-like and no higher than wide, whereas in *lepidus* they are elongate and slenderly spindle-shaped.

The Femur-nigrum Group

To this group we refer, in the following sequence, *calidus* Scudder, *chiricahuae* Hebard, *femur-nigurm* Scudder, *snowii* Scudder, *magdalenae* here described and *truncatus* Scudder.

Striking differentiation is shown by all; *chiricahuae*, *femur-nigrum* and *snowii* are clearly nearer each other and the same is true of *magdalenae* and *truncatus*.

All have the external pagina of the caudal femora dark (except in the palest examples of *quadratus* and *truncatus*) and uniformly colored with a very conspicuous pale longitudinal ventral marginal band. The pronotum is very bluntly rounded obtuse-angulate produced except in *magdalenae* and *truncatus*. The tegmina are rather broad lanceolate pads with bluntly rounded apices. The apex of the male abdomen is enlarged, often very strongly so, with furcula very small, supra-anal plate moderately broad and subgenital plate with dorso-distal margin distinctly convex produced but not showing any tendency toward tuberculation except in *magdalenae*. The penis is of very dissimilar character in *quadratus*, *femur-nigrum* and its nearest allies, *magdalenae* and *truncatus*.

Melanoplus calidus Scudder (Pl. XXIV, fig. 6)

1899. *Melanoplus calidus* Scudder, Proc. Davenport Acad. Nat. Sci., VII, p. 203. [♂, ♀;[12] Gilman's Ranch, Eagle Creek, White Mountains, New Mexico, at 7000 feet.]

1902. *Melanoplus quadratus* Scudder, Proc. Davenport Acad. Nat. Sci., IX, p. 49. [♂, ♀; South Fork of Eagle Creek, White Mountains, New Mexico, at 8100 feet.]

1909. *Melanoplus calidus* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1909, p. 165, text figs. 15 and 16. [♂, ♀; Cloudcroft, [Sacramento Mountains], New Mexico, at 8600 to 8700 feet.]

[12] These and specimens from the South Fork of Eagle Creek were recorded by Scudder and Cockerell as *calidus* in 1902.

Comparison of the original series with the material now available shows *quadratus* to be an absolute synonym of *calidus*. We had at first thought that the large series from Cloudcroft might represent a geographic race, due to the brown general coloration and small size of the specimens when compared with the strikingly olivaceous (except in much discolored individuals) and large size of the specimens in the series from the White Mountains. In all diagnostic characters, however, including the penis (here figured), such close agreement is shown that we are strongly of the opinion that the differences noted are wholly attributable to conditions of local environment. Material from other localities in this practically continuous mountain uplift will alone enable us to tell whether any geographic significance is indicated.

The size variation in the Sierra Blanca series taken at 10500 feet is as great as in the entire series secured from 8000 to 10800 feet. The decided majority of that series is about intermediate between its extremes given below.

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Length of caudal femur
Sierra Blanca, N. M.	17.–20.	4.8–5.9	2.8–3.2	5.–6.8	11.2–13.4
Cloudcroft, N. M.	16.2–17.2	4.–4.3	2.–2.3	4.2–5.2	10.–11.
♀					
Sierra Blanca, N. M.	22.3–27.8	5.5–6.8	3.2–4.6	6.7–8.2	12.9–14.3
Cloudcroft, N. M.	18.2–23.3	5.–5.2	3.–3.3	5.2–6.1	11.3–12.2

The caudal femora are always a clear rich pink, as are the ventro-internal portions of the caudal femora.

The following seventy six specimens have not been previously reported.

New Mexico: Sierra Blanca, White Mountains, 9300 to 10800 feet, VII, 20, 1930, (E. R. Tinkham; the insect was not found from above timber line to the summit), 33 ♂, 18 ♀. South Fork of Eagle Creek, White Mountains, 8000 to 8300 feet, VIII, 19 and 20, (C. H. T. Townsend), 1 ♂, 5 ♀, taken with types of *quadratus*, [U. S. N. M. and Hebard Cln.]. Cloudcroft, Sacramento Mountains, VI, 28, 1932, (R. H. Beamer), 7 ♂, 12 ♀, [Univ. of Kansas].

Melanoplus chiricahuae Hebard (Pl. XXVII, fig. 9)

1922. *Melanoplus chiricahuae* Hebard, Trans. Amer. Ent. Soc., xlviii, p. 61, pl. 3, figs. 9 and 10. [♂, ♀; Ida's Peak, Chiricahua Mountains, Arizona, at 8000 feet.]

A series of twenty six males and nineteen females was taken at 8500 feet in the Chiricahua Mountains on September 15, 1931, by E. R. Tinkham for the author and seventeen males and six females on July 8, 1932, by R. H. Beamer for the University of Kansas. In all the caudal tibiae are glaucous. The penis is here figured.

Melanoplus femur-nigrum Scudder (Pl. XXIV, figs. 7, 8 and 9)

1899. *Melanoplus femur-nigrum* Scudder, Proc. Davenport Acad. Nat. Sci., VII, p. 165, pl. 7, fig. 4. [♂, ♀; San Francisco Mountains, Arizona.]

1908. *Melanoplus femur-nigrum* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1908, p. 397. [♂, ♀; Bright Angel [trail, Coconino Plateau], Arizona.[13]]

This species is widely distinct from *M. indigens* Scudder and Scudder was certainly incorrect in erecting an "Indigens Series" as that species is a member of the distinctive Oregonensis Group.

Normally deep glaucous, the caudal tibiae are pink, usually of a deep shade, in only sixteen females from the San Francisco Mountains. Such dichromatism confined to the female sex is known elsewhere only in *snowii* Scudder, *saltator* Scudder and *ascensus* Scudder.

ARIZONA: Ten miles east of Flagstaff, Coconino Plateau, VII, 20, 1930, (E. R. Tinkham; undergrowth in Western Yellow Pine forest, *Pinus ponderosa*), 1 ♂, 2 ♀. San Francisco Mountains, VII, 10, 1913, (A. K. Fisher), 1 ♂, [U. S. N. M.]; 8500 to 9200 feet, VII, 28, 1930, (E. R. Tinkham; under pines), 4 ♂, 6 ♀; VII, 30, 1897, (J. L. Hancock), 10 ♂ *paratypes*, 14 ♀, *allotype* and topotypes; 9200 to 10000 feet, VII, 31, 1919, (Rehn and Hebard; few in lower forest and meadow, very common above in meadow to near its upper limit where it was replaced by *M. truncatus* Scudder), 84 ♂, 100 ♀, 1 juv. ♂, 2 juv. ♀; 9000 feet, VII, 31, 1919, (Rehn and Hebard; few in scant grasses and plants in upper margin of Western Yellow Pine forest), 2 ♂, 1 ♀, 1 juv. ♀; 8000 feet, VII, 31, 1919, (Rehn and Hebard; very scarce in scant grasses and plants in Western Yellow Pine forest on lower slopes), 3 ♂, 1 juv. ♀; IX, 8, 1932, (E. D. Ball), 2 ♂, 3 ♀, [Univ. of Arizona]. Flagstaff, Coconino Plateau, VIII, 1 and 5, 1933, (R. H. and J. D. Beamer), 1 ♂, 2 ♀, pair in coitu, [Univ. of Kansas]; (C. N. Ainslie), 2 ♀, [U. S. N. M.] Williams, Coconino Plateau, VI, 30, 1932, (E. D. Ball), 1 ♂, 1 ♀. Bill Williams Mountain, IX, 14 to 30, 1917, (O. C. Poling), 10 ♂, 20 ♀. Oak Creek Canyon, VII, 30, 1930, (E. R. Tinkham), 2 ♂, 1 ♀; VIII, 9, 1932, (R. H. Beamer), 11 ♂, 8 ♀, [Univ. of Kansas]. Dewey, IX, 9, 1917, (O. C. Poling),

[13] We are now certain that a female then recorded was incorrectly labelled "Albuquerque, N. Mex.". The species does not occur east of the Coconino Plateau in Arizona, and is replaced by *snowii* Scudder in the White Mountains of this state.

1 ♂. Senator, VIII, 12, 1917, (J. A. Kusche), 1 ♀. Mount Union, VIII, 15, 1917, (J. A. Kusche), 2 ♂.

Melanoplus snowii Scudder (Pl. XXIV, fig. 10; pl. XXV, fig. 1)

1897. *Melanoplus snowii* Scudder, Proc. U. S. Nat. Mus., xx, p. 274, pl. 18, fig. 7. [♂, ♀; Magdalena [Mountains], New Mexico.]

Dr. R. H. Beamer has aided greatly in our studies in having obtained permission to send us the type and allotype of this species for examination, which specimens belong to the University of Kansas.

The penis is here figured for the first time. The species is much more closely related to *femur-nigrum* than to any of the others of the present group.

Though the caudal tibiae are rich glaucous in all of the males they are pink or glaucous in the females, as follows: Magdalena Mountains, New Mexico, 6 pink, none glaucous; Alpine, Arizona, 2 pink, 5 glaucous; White Mountains, Arizona, 11 pink, 7 glaucous. Such dichromatism peculiar to the female sex is here discussed under *femur-nigrum* Scudder.

New Mexico: Magdalena Mountains, 9600 to 9900 feet, VII, 23, 1933, (E. R. Tinkham; on eastern slopes among scrub oaks and grasses), 12 ♂, 10 ♀. Arizona: McNary, VIII, 29, 1932, (E. D. Ball), 1 ♂. Alpine, VI, 24, 1932, (E. D. Ball), 4 ♂, 7 ♀, [Univ. of Arizona and Hebard Clns.]. White Mountains eight miles west of Springerville, 9300 feet, VII, 25, 1930, (E. R. Tinkham; four in meadows, twenty one on pine forest floor), 11 ♂, 16 ♀. White Mountains twenty five miles west of Springerville, 10000 feet, VII, 25, 1930, (E. R. Tinkham; in mountain meadows), 4 ♂, 2 ♀.

Melanoplus magdalenae new species (Pl. XXV, figs. 2, 3, 4 and 5)

This insect supplants *M. snowii* Scudder at higher elevations in the Magdalena Mountains, just as *truncatus* Scudder supplants *femur-nigrum* Scudder in the San Francisco Mountains.

It is clearly nearest *truncatus*, the general coloration and color pattern being very similar, the male furcula and cerci being nearest those of that species but showing distinctive features. The insect is distinctly less robust, the male with apex of abdomen less enlarged, supra-anal plate much shorter, cerci tapering more conspicuously in distal portion, penis with processes very differently shaped and subgenital plate with apical tubercle considerably more prominent.

In both of these species the caudal tibiae are normally rich pink, but larger series may show rare individuals of both sexes to have the caudal tibiae buffy weakly tinged proximad and distad with brown as is the case in *truncatus*.

The structure of *truncatus* gives to it a suggestion of the general appearance of a small species of *Conalcaea*; this is shared to some extent by the present species.

Type.—♂; Magdalena Mountains, New Mexico. Elevation 9900 feet. July 23, 1930. (E. R. Tinkham). [Hebard Collection, Type no. 1265].

Size medium, form more robust than average. Vertex and frontal costa as in *truncatus*, slightly broader than in *femur-nigrum;* the former concave between the distinct lateral carinae, the latter lacking lateral carinae, broadening appreciably to opposite median ocellus and distinctly impressed about it. Pronotum with medio-longitudinal carina percurrent but strongest on metazona, sulci distinct on dorsum, caudal margin of dorsum almost transverse and showing extremely faint convexity. Prosternal spine moderately elongate, rounding distad to the rather strongly rounded apex, not as slender as in *femur-nigrum* or *truncatus*. Tegmina ovate pads separated by an interval (very narrow to rather decided in series), considerably shorter than pronotum. Apex of abdomen very conspicuously thickened though not as much enlarged as in *truncatus*. Furcula represented by small stout tapering spikes, each less than twice as long as its basal width, shorter than in *truncatus*. Supra-anal plate decidedly shorter and more simple than in that species, slightly longer than proximal width, shield-shaped, lateral margins convex, lateral portions longitudinally broadly concave with intervening median sulcus coarse proximad, then followed by a low flattened carina which is impressed distad, short disto-lateral carinae very vaguely suggested. Cercus of same general type as in *truncatus* but not showing flattening of external surface and with apical portion narrower; very short, broad proximad, tapering distad to a broadly rounded apex which is directed dorso-distad, dorsal margin broadly and evenly concave, ventral margin broadly convex, then very faintly concave and becoming almost straight in distal portion. Penis broad, erect, shaft with margins meeting caudad to form a V-emargination, proximal processes large, erect, in caudal aspect with apices pointed but in lateral aspect these are seen to be produced in delicate rounded rectangular flanges directed cephalad, succeeding processes prominent, erect and fairly broad lamellate plates with almost attingent sharply

rounded apices reaching as far as the bases of the apices of the proximal processes opposite the termination of the incurled lateral portions of those processes. Subgenital plate convex with a prominent apical tubercle.

Allotype.— ♀ ; same data as type. [Hebard Collection].

Considerably larger and more robust than male. Pronotum with medio-longitudinal carina (usually) almost as decided on prozona as on metazona. Prosternal spine broader proximad but with sharply rounded apex. Tegmina broader (sometimes almost circular), separated by a decided (to very decided) interval. Ovipositor valves moderately elongate, apices well curved, dorsal pair with dorso-external margins irregularly and not decidedly toothed but dorsal surfaces in proximal portion with a number of very irregular and broken rows of teeth.

The extremes in the series measure as follows: length of body ♂ 16. to 17.5, ♀ 20. to 21.; length of pronotum ♂ 4.2 to 5.1, ♀ 5.3 to 5.8; caudal width of pronotal disk ♂ 2.7 to 3., ♀ 3.9 to 4.1; length of tegmen ♂ 3.2 to 4, ♀ 2.4 to 4.1; length of caudal femur ♂ 10.1 to 11.1, ♀ 11.1 to 11.6 mm.

The apex of the abdomen is curled upward in males and the length here given is taken with this in normal position, not straightened out.

Generally dark chocolate brown, postocular bar very broad, percurrent on pronotal lateral lobes, rarely flanked dorsad narrowly with dull buffy. Face, genae and ventral portions of lateral lobes buffy washed with reddish brown or dull olivaceous. Oblique streak on pleura very conspicuous, clear buff. Dorsum of abdomen often paler and more reddish brown than elsewhere. Cephalic and median limbs buffy, often heavily suffused with dull olivaceous. Caudal femora dorsad usually suffused and dark, sometimes buffy with two weakly indicated transverse bands on inner portions only, external pagina solid shining deep chocolate very narrowly margined dorsad (this widest proximad) with buffy and with a broad, very conspicuous, longitudinal ventral marginal band of cream color; ventral surfaces vandyke red with base and a pre-genicular annulus of buffy, genicular areas very dark brown paling only on the lobes. Caudal tibiae deep pink, paler on sides, with a post-proximal brown fleck.

A series of twelve male and five female paratypes was taken with the type from 9800 to 9900 feet on the north slopes of the Magdalena Mountains in grass under Aspen, *Poplus tremuloides*, saplings.

Melanoplus truncatus Scudder (Pl. XXV, figs. 6, 7, 8 and 9)

1899. *Melanoplus truncatus* Scudder, Proc. Davenport Acad. Nat. Sci., VII, p. 177, pl. 7, fig. 8. [♂, ♀; San Francisco Mountains, Arizona.]

This insect is compared with *magdalenae* under the description of that species. It is clearly a more highly specialized insect. The distinctive penis is here figured.

Normally rich pink, the caudal tibiae externally suffused with brown on the sides proximad and distad in five males and buffy with a very faint glaucous tinge in three females of the very large series from the San Francisco Mountains. Such dichromatism of the caudal tibiae is distinct from that found in *femur-nigrum* and *snowii*.

A moderate number of females are very dull light olivaceous yellow in general coloration with dark postocular bar reduced to different degrees and dark area of external pagina of caudal femora usually obsolete, rarely weakly indicated.

The following one hundred and fifty three specimens have been studied.

ARIZONA: White Mountains, 9300 feet, VII, 24, 1930, (E. R. Tinkham; on floor of pine forest), 3 ♂, 1. San Francisco Mountains, VII, 28, 1930, 9400 to 9600 feet, (E. R. Tinkham; north slope in grass under Aspen, *Poplus tremuloides*), 1 ♂, 1 ♀; VII, 30, 1897, (J. L. Hancock), 3 ♂, *paratypes;* 9700 to 10000 feet, VII, 31, 1919, (Rehn and Hebard; moderately common in upper mountain meadow especially in areas of *Sieversia ciliata* (Pursh.), a few above in heavy stands of balsam and Aspen thickets, these very intensive in coloration), 50 ♂, 72 ♀, 4 juv. ♂, 6 juv. ♀; VIII, 5, 1933, (R. H. Beamer), 1 ♂, 6 ♀, [Univ. of Kansas]; VIII, 10 and IX, 8, 1932, (E. D. Ball), 2 ♂, 2 ♀, [Univ. of Arizona]. Bill Williams Mountain, IX, 15 to 30, 1917, (O. C. Poling), 1 ♀.

The Artemisiae Group

This group is erected to include *artemisiae* Scudder and a closely related species *lemhiensis* here described. They are separable only by the male genitalia, which differ as follows:

A. Furcula very small, slender. Cercus with disto-ventral angle no more or very slightly more broadly rounded than the disto-dorsal angle, the dorsal and ventral margins of the distal portion parallel. Generally similarly specialized penis much narrower. Salmon River Mountains, Idaho, from 4000 to 6650 feet..... *artemisiae* Scudder

AA. Furcula very small, moderately stout. Cercus with disto-ventral angle decidedly more broadly rounded than the disto-dorsal angle, the dorsal and ventral margins of the distal portion convergent due to definite obliquity of the latter. Generally similarly specialized penis much heavier and broader. Cow Creek, Lemhi Mountains, Idaho, from 4300 to 4400 feet..... *lemhiensis* new species

Both species are grayish brown with darker markings not conspicuous, in general appearance closely resembling *salmonis* here described except that the caudal tibiae are pale glaucous. Relationship, however, is not close either to that species or the similarly grayish mottled but submacropterous *kennicotti* Scudder. Both of those species have very different male genitalic specialization.

Other features characterizing the group are the pad-like ovate tegmina with blunt lanceolation suggested, the male with small cerci which have the distal portion bent both inward and upward and its external surface conspicuously impressed and concave and male subgenital plate with a submarginal apical tubercle.

Melanoplus artemisiae Scudder (Pl. XXVI, figs. 1 and 2)

1897. *Melanoplus artemisiae* Scudder, Proc. U. S. Nat. Mus., xx, p. 217, pl. 11, fig. 8. [♂, ♀; Salmon City, Idaho.]

The original series was secured by L. Bruner, probably in the foothills of the Salmon River Mountains west of the town, as it was there that Rehn and Hebard first secured specimens, though close search for the species at a number of localities nearer Salmon City proved fruitless.

Four males and two females of the original series, a pair being paratypes, are in the author's collection, but the figured male was selected as type by Rehn and Hebard in 1912, which specimen was not returned to Bruner by Scudder and is consequently now at the Museum of Comparative Zoology.

The following additional material is before us:

IDAHO: Foothills of Salmon River Mountains just west of Salmon City, 4000 feet, VIII, 14, 1928, (Rehn and Hebard; very rare in area thickly covered with sage brush and a few composites), 2 ♂, 1 ♀. Upper Canyon, Morgan Creek, Salmon River Mountains, 6650 feet, VIII, 15, 1928, (M. Hebard; small numbers in sage brush on hillsides, difficult to capture as the sage brush was very large and thick), 1 ♂, 1 ♀.

Melanoplus lemhiensis new species (Pl. XXVI, figs. 3, 4 and 5; pl. XXVII, fig. 5)

This insect is generally very similar to *artemisiae*, differing as noted above. These species and *salmonis* here described have the dark postocular band often solid in males, broken by a small pale fleck in females; never as broad or as sharply defined as in *montanus* (Thomas).

Type.—♂; Cow Creek, Lemhi Range, near Salmon River, Idaho. Elevation 4300 to 4400 feet. August 13, 1928. (Rehn and Hebard). [Hebard Collection, Type no. 1260].

Agrees very closely with *salmonis* here described in size, form, pronotum, general coloration and color pattern. Vertex slightly narrower. Frontal costa showing impression only in immediate vicinity of median ocellus. Eye deeper than in *salmonis*, about one and four-fifths times length of infra-ocular sulcus. Tegmina very short, considerably shorter than pronotum, feebly overlapping, distad rounding to a (normally) weak emargination at juncture of dorsal and lateral fields,[14] the apex in dorsal field rounded angulate produced. Furcula represented by two very small processes springing from the tergite without convexities preceding them, the projecting portion blunt triangular (varying to rounded quadrate) and very slightly (to distinctly) longer than its basal width. Supra-anal plate triangularly shield-shaped, longer than proximal width, surface moderately specialized, medio-longitudinal sulcus deep in proximal three-fifths (thence varying from weak to obsolete). Cercus small, about twice as long as proximal width, proximal portion (slightly less than half of cercus) scarcely narrowing, subquadrate, slightly deeper than long; distal portion flattened, bent inward and upward, its outer surfaces weakly concave, its dorsal and ventral margins very weakly convergent and very weakly convex, the disto-dorsal angle broadly rounded, the disto-ventral angle very broadly rounded; apices approaching each other and briefly separated just before apex of supra-anal plate. Subgenital plate with a small blunt subapical tubercle. Penis much broader but of same general type as that of *artemisiae* (see plate XXVI, figure 4).

Allotype.—♀; same data as type. [Hebard Collection].

Agrees with type except as follows. Size much larger, form much more robust though not as robust as in this sex of *salmonis*.

[14] This is rarely very weakly indicated in *artemisiae*. It is a condition which never occurs in the great majority of the brachypterous species of *Melanoplus*.

Eye one and one-quarter times as long as infra-ocular sulcus. Prosternal spine conical, sharply rounded at apex. Tegmina almost attingent (varying in series from attingent to narrowly separated), with shallow emargination at juncture of distal margins of dorsal and lateral fields distinct (rarely very weak in series). Ovipositor valves of medium length with distal curvature decided (as in *artemisiae*, stronger than in *salmonis*).

Seven male and ten female paratypes bear the same data as the type. The extremes measure: length of body ♂ 17.5 to 18.7, ♀ 22.3 to 24; length of pronotum ♂ 4.2 to 4.6; ♀ 5. to 5.7; caudal width of pronotal disk ♂ 2.2 to 2.4; ♀ 3. to 3.3; length of tegmen ♂ 3.2 to 4.2, ♀ 3.8 to 4.9; width of tegmen ♂ 2. to 2.2; ♀ 2.1 to 2.8; length of caudal femur ♂ 9.1 to 9.3, ♀ 10.7 to 11.8 mm.

Color as described for *salmonis* except as follows. Occiput and disk of pronotum light brownish, this continued on dorsal fields of tegmina, but in frequent specimens the lateral fields of the tegmina are definitely darker. Such individuals show a tegminal bicoloration usual in the species of the Rileyanus Group, which group is, however, not at all closely related. Caudal femoral dark bars very weak. Caudal tibiae very pale dull glaucous.

This interesting series was secured on steep slopes of rock fragments thickly overgrown with sage brush. The species was common only on the steepest upper slopes where there were many tufts of a fine dry yellow grass. The insect is a powerful though slow leaper, suggesting in its actions *Oedaleonotum borckii orientis* Hebard (another inhabitant of the sage brush in the Great Basin), but instead of immediately jumping into another bush individuals usually leaped about in the open and were consequently much easier to capture. Limited time alone prevented assembling a large series and the spot would have been revisited had we realized that the insect would not be found anywhere else in the hills along the Salmon River. North of that river in this region *lemhiensis* is apparently supplanted by *artemisiae*.

The Montanus Group

We would have separated *montanus* and *idaho* here described in a group distinguished from *washingtonius* and its allies by the more contrasting coloration with postocular bar unbroken and in sharper contrast, pronotum with definitely weaker demarkation

of disk from lateral lobes and cerci with broader and more definitely truncate apices, were it not for *salmonis* here described, a species which is clearly nearer the former but has the pronotal contour and as little contrast in coloration as the latter species, while the shorter and more tapering cerci are distinct from either.

The species included in this group have pad-like tegmina, simple male cerci which are neither bent inward nor have the external surfaces of their apices concave, male subgenital plate with tubercle very weak to rather well developed and pink caudal tibiae.

Melanoplus montanus (Thomas) (Pl. XXVII, fig. 7)

1873. *Pl[atyphyma] montana* Thomas, Rept. U. S. Geol. Surv. Terr., v, p. 155. [♂, ♀; Montana.]

Until the penis of this species and its allies was studied, decided uncertainty existed as to whether or not races instead of species were represented. Large series now before us representing all the known as well as a number of undescribed forms show that each must be given full specific status.

The following material, in addition to large series already reported,[15] is now before us:

ALBERTA: Cold Lake, VI, 12, 1930, (E. R. Tinkham), 1 ♂ (showing extreme depauperation).

MONTANA: Avalanche Lake, Glacier National Park, 4400 feet, VIII, 17, 1930, (E. R. Tinkham), 2 ♂, 1 ♀. Haugan, VIII, 9, 1931, (R. H. Beamer), 18 ♂, 21 ♀, [Univ. of Kansas].

WYOMING: Big Horn Mountains, (L. Bruner), 2 ♂. Mount Washburn, Yellowstone National Park, western slope at 9300 feet, VIII, 13, 1922, (M. Hebard; in scant vegetation on edge of conifer forest), 2 ♂; 8600 feet, VIII, 18, 1930, (E. R. Tinkham; in long grass on south slope), 1 ♂, 1 ♀.

BRITISH COLUMBIA: Crows Nest, VIII, 31, 1930, (E. R. Buckell), 1 ♀.

The distribution of this species is now known to extend north to Cold Lake, Alberta: east as far as that locality and the Waterton Lakes, Alberta; Avalanche and Upper Little St. Mary Valley in the Glacier National Park, Helena and Bozeman Mountain,

[15] Glover; Illustr. N. A. Ent., Orth., pl. 18, fig. 11, (1874). Scudder, Proc. U. S. Nat. Mus., xx, p. 232, pl. 15, fig. 8, (♂, ♀; Montana), (1897). Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1906, p. 409, (Wyoming records). Hebard, Proc. Acad. Nat. Sci. Phila., LXXX, p. 272, (Montana records), (1928). Hebard, Proc. Acad. Nat. Sci. Phila., LXXXII, p. 393, (Alberta records), (1931).

Montana; Crescent Hill in the Yellowstone National Park and the Big Horn Mountains of Wyoming: west to Banff, Alberta; the Swan Range, Beaver Creek and West Yellowstone, Montana: south to the latter, Norris Pass in the Yellowstone National Park and the Big Horn Mountains, Wyoming.

In its distribution southward it becomes paler, more contrastingly marked and larger, males measuring as follows:

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Length of caudal femur
Cold Lake, Alberta.	11.1	2.7	1.4	2.8	6.9
Banff, Alberta.	16.8	3.8	2.3	3.8	7.9
Waterton, Alberta.	18.3	4.7	2.7	4.1	9.8
Bozeman Mountain, Montana.	19.8	4.8	2.9	5.	10.2
Mammoth Hot Springs, Wyoming.	20.	4.7	2.9	4.8	10.3

Melanoplus idaho new species (Pl. XXVI, fig. 6; pl. XXVII, figs. 6 and 8)

This striking species is very closely related to *montanus* (Thomas). In coloration it shows as great contrasts as the maximum developed in that species. The male cerci are mesad definitely bent upward but the penis shows decidedly the most distinctive development.

Type.—♂; Cow Creek, Lemhi Range at Salmon River, Idaho. Elevation 4350 feet. August 13, 1918. (M. Hebard). [Hebard Collection, Type no. 1261].

Size larger and form more robust than in *salmonis* here described, much as in males of *montanus* from southern Montana. Vertex beyond eyes strongly declivant with impression narrow, frontal costa feebly impressed only about median ocellus. Pronotum with lateral carinae obsolete on prozona and very weak on metazona so that the disk merges into the lateral lobes more gradually than in *montanus* and much more gradually than in *salmonis*, medio-longitudinal carina weak on metazona, very weak on prozona and obsolete there between the decided transverse sulci; caudal margin of disk very weakly obtuse-angulate produced. Prosternal spine rounded conical. Tegmina short, shorter than pronotum, separated by a narrow interval, ovate pads with apices sharply rounded. Furcula represented by two small stout truncate processes springing from weak convexities

of the tergite, the projecting portion feebly widening proximad and twice as long as broad. Supra-anal plate shield-shaped, distinctly longer than proximal width, medio-longitudinal sulcus deep in slightly over proximal half, a short coarse carina on each side of apical portion. Cercus of only moderate size, proximal half slightly narrowing, shaft there bent dorso-distad and showing extremely slight widening to the truncate apex which has the disto-dorsal angle more strongly rounded and more produced than the disto-ventral angle. Penis very broad and heavy, with two broad erect convoluted plates cephalad before which are two nearly adjacent erect aciculate processes, each of which proximad has a very delicate rounded flange on its outer margin. Subgenital plate with a very low blunt apical tubercle feebly suggested.

Length of body 19., length of pronotum 4.7, caudal width of pronotal disk 3.7, length of tegmen 3., length of caudal femur 9.2 mm.

General coloration light ochraceous buff, occiput and dorsal surface of pronotum sayal brown (a light brown), tegmina slightly darker. A very broad unbroken postocular bar, all but ventral portions of pleura, large areas laterad on abdominal tergites (which decrease in size on each tergite and are extremely small on the distal tergites) and apices of cerci blackish brown. Eyes warm sepia. Antennae mikado brown (more reddish). Caudal femora with two bars of dark brown dorsad of which the second is heaviest, these extend on the external pagina as broad oblique suffusions reaching only slightly below the median line, apices mikado brown, ventral and internal surfaces light ochraceous buff. Caudal tibiae light ochraceous buff tinged with pink.

This specimen was on a steep slope where, when disturbed, it had jumped out of an area thickly covered with sage brush onto a slide of bare rock fragments. A single female only was seen in addition, but most of our time was occupied at this locality in collection a series of *lemhiensis* here described, as we did not then recognize the present insect to be undescribed.

Melanoplus salmonis new species (Pl. XXVI, figs. 7 and 8)

This remarkable species in general appearance and marking shows close resemblance to *artemisiae* Scudder, in which species and the allied *lemhiensis* here described, however, the caudal tibiae are pale glaucous; in the present species yellow buff tinged with pink distad; in the other species of the Montanus Group richer pink.

The male genitalia are distinctive. The cerci are not inbent distad, the tubercle of the subgenital plate is subapical, these features and the general structure of the penis indicating that the insect is a member of the Montanus Group and not of the Artemisiae Group. The distal tapering of the cerci is distinctive, these appendages otherwise suggesting those of *montanus* (Thomas) and *idaho* here described more closely than those of the succeeding species.

Type.—♂; upper Morgan Creek, Salmon River Mountains, Idaho. Elevation 7080 feet. August 15, 1928. (Rehn and Hebard). [Hebard Collection, Type no. 1273.]

Size and form medium. Vertex as in *oreophilus* Hebard, surface shallowly concave between the distinct lateral carinae, frontal costa weakly depressed particularly in the vicinity of the median ocellus. Pronotum similar; medio-longitudinal carina weak on metazona, very weak on prozona and obsolete between the transverse sulci; caudal margin of disk weakly obtuse-angulate produced with angle broadly rounded. Prosternal spine very blunt conical. Tegmina short, shorter than pronotum, feebly overlapping (to narrowly separated in other male paratypes) ovate pads, slightly more sharply rounded (to broadly rounded in one male paratype) at apices (not lanceolate as in the other species of this group). Furcula represented by two very small stout processes springing from weak convexities of the tergite, the projecting portion no longer than broad. Supra-anal plate triangularly shield-shaped, no longer than proximal width and definitely shorter than in *oreophilus;* surface little specialized, medio-longitudinal sulcus percurrent but deep only in proximal two-fifths. Cercus small and simple, about three times as long as proximal width, dorsal margin concave and ventral margin convex particularly proximad, these margins gradually convergent to the rounded apex; the apical two-fifths of the cercus with external surface very feebly and irregularly impressed. Subgenital plate with a small blunt subapical tubercle.

Allotype.—♀; same data as type. [Hebard Collection].

Agrees with type except as follows. Size much larger, form much more robust. Vertex broader. Eye one and one-third times as long as infra-ocular sulcus. Prosternal spine shorter. Tegmina separated by a narrow interspace (and similar in the four paratypic females), sublanceolate (individually variable, in two female paratypes with apices broadly rounded). Ovipositor valves moderately elongate, with distal curvature moderately decided.

Three male and four female paratypes, bearing the same data as the type, are before us. The extremes measure: length of body ♂ 14.2 to 17.8, ♀ 22.2 to 23.3; length of pronotum ♂ 3.2 to 3.9, ♀ 5. to 5.2; caudal width of pronotal disk ♂ 2.2 to 2.4, ♀ 3.5 to 3.6; length of tegmen ♂ 2.8 to 3.7, ♀ 4.7 to 5.1; width of tegmen ♂ 1.8 to 2.2, ♀ 2.8 to 2.8; length of caudal femur ♂ 7.7 to 9.7, ♀ 10.8 to 11. mm.

General coloration grayish brown. Head and pronotum mottled brown, postocular bar only slightly darker and often including a buffy dot. Tegmina appearing more grayish. Abdomen buffy, in dorsal portions very thickly mottled with brown. Caudal femora light brown with two broad but only moderately darker bars, apices darker brown, ventral surface buff faintly tinged with yellow. Caudal tibiae buff faintly tinged with yellow proximad, becoming pale pink in other portions.

The small series was taken only after considerable effort, on an open hillside surrounded by forest with low cover largely of alpine plants and some sage brush. The species was there local and usually near the latter bushes.

Melanoplus washingtonius (Bruner) (Pl. XXVI, fig. 9)

1885. *Pezotettix washingtonius* Bruner, Canadian Ent., XVII, p. 14. [♂, ♀; Loon Lake, Colville Valley, Washington.]

1897. *Melanoplus washingtonianus* Scudder, Proc. U. S. Nat. Mus., XX, p. 233, pl. 15, fig. 9.

This species was recorded in 1906[16] as *M. validus* from Nelson, British Columbia, which error was corrected by Walker in Buckell in 1922.[17]

We had been long doubtful as to the validity of *washingtonius*, but examination of the penis of the species of this group shows that of the type of this species to be very different from that of its nearest allies, *repetinus* here described and *oreophilus* Hebard. The penis in these species is distinctive in each, shows very slight individual variation and none toward any of the others. Except that the male cerci are not subspatulate distad and are more definitely truncate at their apices, however, we can find no ex-

[16] Material from Lake Agnes and Fairview, Alberta, recorded as *washingtonianus* by Caudell in 1906, has since been correctly assigned to *montanus*.

[17] Proc. Ent. Soc. British Columbia, No. 20, p. 33.

ternal features sufficiently constant to enable certain identification.[18]

In addition to the type, allotype and a paratypic male the following material is in the author's collection.

British Columbia:[19] Cranbrook, VIII, 20, 1925, (E. R. Buckell), 1 ♂, 1 ♀. Revelstoke Mountain, VIII, 12, 1923, (P. N. Vroom), 1 ♂, 1 ♀. Rockcreek, VI, 9 to 25, 1922 and 1923, 3 ♂; VIII, 21, 1922, 1 ♀, (all E. R. Buckell). Aspen Grove, VII, 13 and 14, 1922, (E. R. Buckell), 6 ♂, 5 ♀. Merritt, VIII, 3, 1931, (R. H. Beamer); 1 ♀, [Univ. of Kansas].

Idaho: Wallace, VIII, 19, 1917, 1 ♀.

Melanoplus repetinus new species (Pl. XXVI, fig. 10)

1920. *Melanoplus oreophilus* Hebard (in part), Trans. Amer. Ent. Soc., xlvi, p. 384. [♂, ♀; Washington Gulch in the foothills of the Elkhorn Range of the Blue Mountains, Oregon.]

In 1920 the male penis was not known to show striking diagnostic characters in many species of the Melanopli. In this organ *repetinus* differs very widely from *oreophilus*, but in coloration, color pattern and external structure it agrees so closely that we can find no other feature by which individuals may be distinguished with any certainty. Such a situation has recently been found by us in species we have described, *cherokee* and *acrophilus* of the Viridipes Group of *Melanoplus*. The value of the penis in distinguishing certain species of *Melanoplus* was discovered some years ago by T. H. Hubbell, who at that time found that *packardii* and *foedus foedus* had been generally confused, but that the very different penis would at once show to which species any male belonged.

In large series of both *repetinus* and *oreophilus* before us the structure of the penis is strikingly constant and in no individual is convergence between the two shown.

Type.—♂; Middle Onion Patch, Strawberry Peak, Oregon. Elevation 8250 feet. August 21, 1928. (Rehn and Hebard). [Hebard Cln., Type no. 1262].

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[18] Variation in degree of development of a subapical tubercle on the subgenital plate excludes this feature as a character of value, though when we described *oreophilus* we believed it had diagnostic importance.

[19] E. R. Buckell has kindly sent us the additional information that he has also examined material of *washingtonius* from Premier, Wasa, Nelson, Grand Forks, Nicola and Canyon House, British Columbia.

Size and form medium. Vertex slightly narrower than in *oreophilus*, surface shallowly depressed between the distinct lateral carinae; frontal costa weakly depressed in vicinity of median ocellus. Eye proportionately slightly smaller than in *oreophilus*, nearly one and one-half times as long as infra-ocular sulcus. Pronotum much as in that species and *washingtonius*, disk more clearly separable from lateral lobes than in *montanus* particularly caudad; medio-longitudinal carina weak on metazona, weak on prozona and obsolete between the sulci there; transverse sulci weak; caudal margin of disk weakly obtuse-angulate produced with angle broadly rounded. Prosternal spine rather sharply conical. Tegmina as in *oreophilus* and *washingtonius*, slightly longer than pronotum, subattingent (but slightly overlapping in great majority of series), lanceolate pads. Furcula represented by two small stout processes springing from convexities of the tergite, the projecting portions about twice as long as broad with apices rounded. Supra-anal plate triangularly shield-shaped, medio-longitudinal sulcus deep only in proximal two-fifths, disto-lateral short carinae very feeble and parallel. Cercus distinctly over three times as long as proximal width, simple, slightly curved dorsad, distad subspatulate with slight and irregular impression indicated on external surface of that area. Penis distinctive as figured, the outer processes curving almost to meet dorso-mesad but not at all hooding the inner processes as is the case in *oreophilus* (see plate XXVI, figure 10), the inner processes with minute apices curled inward and caudad of these two slender erect straight sharp processes reach almost as far dorsad as the inner processes. Subgenital plate apically rather sharply rounded, so that it might be said to terminate in a tubercle, this not elevated above the lateral margins (and in some males distinctly transverse).

Allotype.— ♀ ; same data as type. [Hebard Collection].

Agrees with type except as follows. Size much larger, form much more robust. Vertex broader. Eye deeper. Prosternal spine heavier conical, with apex sharply rounded. Ovipositor valves moderately elongate, with distal curvature decided.

Generally dull brown; face, genae and lateral lobes of pronotum paler, brownish buff. Postocular bar moderately wide, not very strikingly defined, dark brown, with a fleck or short oblique bar of brownish-buff dorso-cephalad on pronotal lateral lobes (this is normally obsolete in *washingtonius*, usually weakly indicated in *oreophilus*), this more conspicuous in females. Occiput, disk of pronotum and tegmina brown, the latter sometimes slightly mottled with darker brown, occasionally with lateral portions

slightly darker than dorsal portions. Lateral portions of abdomen often very dark, particularly in males. Cephalic and median limbs buffy brown often suffused with darker. Caudal femora dorsad with genicular area and two bands weakly darker brown, external pagina with characteristic marking of this and the allied species; a broad V-shaped dark suffusion followed by a very broad suffused vertical band, the intervening areas often decidedly paler; internal surface with dorsal bands accentuated and intervening areas pale, the pre-genicular area often buff, below and ventral surface jasper red, the latter surface sometimes paling to yellowish medio-longitudinally particularly proximad. Caudal tibiae jasper red with a small proximal dark suffusion; spines black, spurs buffy, black tipped.

The similarity of color pattern to that of *washingtonius* and *oreophilus* and of color as well in specimens from similar environment (the original series of *washingtonius* is recessive and pale, probably due to aridity at the type locality) is remarkable, when the very decided differences in the penis are noted.

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Length of caudal femur
Washington Gulch, Oregon.	17.2–19.	4.–4.3	2.4–2.6	4.7–6.	10.–10.3
Strawberry Peak, Oregon, 8900 feet.	15.8	3.7	2.	4.6	8.8
Middle Onion Patch, Oregon, 8250 feet.	15.6–17.3	3.8–4.3	2.2–2.5	3.6–5.8	9.2–10.
Strawberry Creek, Oregon, 4450 feet.	18.8	4.4	2.7	5.	10.7
♀					
Washington Gulch, Oregon.	23.8–26.	4.8–5.	3.3–3.5	5.3–6.5	11.8–12.
Strawberry Peak, Oregon.	23.	4.8	3.3	5.	10.8
Middle Onion Patch, Oregon.	18.7–23.7	4.3–4.9	3.2–3.3	4.9–6.7	10.8–12.1

A very gradual and slight decrease in size with increase in elevation is shown by the different series taken from the base to the summit of Strawberry Peak. The species was there everywhere scarce or very scarce except in extremely restricted spots in a hudsonian mountain meadow surrounded by a very close stand of Lodgepole Pines (the type locality). Its distribution

there shows that it occurs from the conifer forests composed largely of Western Yellow Pine upward to timber line conditions among stunted stands of the White-bark Pine.

The following eighty eight specimens have been studied:

OREGON: Haines, VII, 10, 1931, (R. H. Beamer), 6 ♂, 5 ♀, [Univ. of Kansas]. Washington Gulch, foothills of Elkhorn Range, Blue Mountains, 3800 to 4300 feet, VIII, 14, 1910, (Rehn and Hebard; one colony on steep pine-clad hillsides, among scant undergrowth in which *Spiraea petufolia* was predominant), 8 ♂, 3 ♀. Four miles east of Summit, Whitman National Forest, Blue Mountains, 4600 feet, VIII, 19, 1928, (M. Hebard; very rare in undergrowth of Western Yellow Pine, Western Larch, fir and spruce forest), 2 ♂, 1 ♀. Summit, Baker-Grant County line, Whitman National Forest, Blue Mountains, 5095 feet, VIII, 20, 1928, (Rehn and Hebard; very scarce in undergrowth of heavy conifer forest), 4 ♂, 8 ♀. Strawberry Peak, Blue Mountains, 8900 feet, VIII, 21, 1928, (Rehn and Hebard; extremely scarce on gravel and rock fragments with small mountain plants among stunted White-bark Pines, *Pinus albicaulis*, no other Orthoptera there or up to 9640 feet at summit), 1 ♂, 1 ♀, *paratypes:* 8400 feet, (Hebard; in Lodgepole Pine forest, *Pinus contorta*), 1 ♀, *paratype.* Middle Onion Patch, Strawberry Peak, Blue Mountains, 8250 feet, VIII, 21, 1928, (Rehn and Hebard); very scarce except locally in hudsonian mountain meadow surrounded by heavy stand of Lodgepole Pine), 19 ♂, 16 ♀, *type, allotype, paratypes,* 1 juv. ♀. Strawberry Peak trail, Blue Mountains, 7100 feet, VIII, 21, 1928, (Rehn and Hebard; few in scanty patches of undergrowth in Western Yellow Pine forest, *Pinus ponderosa*), 10 ♂, 1 ♀, *paratypes.* Strawberry Creek, Blue Mountains, 4450 feet, VIII, 20, 1928, (J. A. G. Rehn; one only seen in undergrowth of conifer forest composed largely of Western Yellow Pine), 1 ♂.

Usually very scarce and always local, the large series was assembled only after many hours of close search through favorable areas, made in an effort to secure all the species of short-winged Melanopli present. Only at Washington Gulch was *M. indigens* Scudder found in addition.

Melanoplus oreophilus Hebard

1920. *Melanoplus oreophilus* Hebard, Trans. Amer. Ent. Soc., XLVI, p. 382. [♂, ♀; northern slopes of Mount Hood, Oregon,[20] from 3290 to 7000 feet (above the latter solid snows).]

The following corrections to our original comments must be made. The species is much more closely related to *washingtonius* than to *montanus*, but the penis is very distinct and shows far

[20] Incorrectly referred to this species, the series from Washington Gulch in the Blue Mountains of eastern Oregon is here properly placed as the closely related but previously unrecognized *repetinus*.

higher specialization than that of those species. Definitely closer affinity to *repetinus*, here described, is shown.

The coloration of material of *washingtonius* from British Columbia, unlike the original series of that species, agrees with that of *oreophilus* in being darker with color pattern less sharply defined and has the ventro-internal and ventral surfaces of the caudal femora deep pink. These features are probably due to conditions of immediate environment and have no diagnostic significance.

The only material which has been subsequently secured is the following:

OREGON: Hood River, VII, 17, 1931, (R. H. Beamer), 1 ♂, [Univ. of Kansas]. Santiam National Forest, Cascade Mountains, (W. J. Chamberlin), 1 ♀, [U. S. N. M.]. South rim of Crater Lake, Cascade Mountains, 7050 feet, VIII, 26, 1928, (Hebard and Farrar; female in fine dry grass on slope of volcanic ash, males on very small ridge of volcanic boulders in open thickly clothed with alpine plants particularly *Eriogonum umbellatum* Torr.; long search failed to disclose other specimens; those taken were very sluggish) 2 ♂, 1 ♀.

EXPLANATION OF PLATES

PLATE XXII

(Lateral view of male cercus. Greatly enlarged.)

Fig. 1.—*Melanoplus sylvaticus* McNeill. Willard, Missouri.

Fig. 2.—*Melanoplus viridipes eurycercus* Hebard. *Type.* Derrick City, Pennsylvania.

Fig. 3.—*Melanoplus viridipes viridipes* Scudder. *Paratype.* Ogle County, Illinois.

Fig. 4.—*Melanoplus beameri* Hebard. *Type.* Leavenworth County, Kansas.

Fig. 5.—*Melanoplus beameri* Hebard. *Paratype.* Leavenworth County, Kansas. (Showing extreme of variation in cercal form in original series.)

Fig. 6.—*Melanoplus similis* Morse. *Paratype.* Murphy, North Carolina.

Fig. 7.—*Melanoplus similis* Morse. (*Paratype* of the synonym *calloplus*, showing variation in form of cercus.) Collison Ridge, Bath County, Virginia.

Fig. 8.—*Melanoplus similis* Morse. Mount Sterling, Haywood County, North Carolina. (Showing variation in form of male cercus very unusual in this species.)

Fig. 9.—*Melanoplus longicornis* (Saussure). Clayton, Georgia.

Fig. 10.—*Melanoplus longicornis* (Saussure). *Type.* North Carolina. (From outline sketched in note book by the author.)

Fig. 11.—*Melanoplus hubbelli* new species. *Type.* Red Hills, Franklin County, Ohio.

Fig. 12.—*Melanoplus acrophilus acrophilus* new species. *Type.* Black Mountain, North Carolina.
Fig. 13.—*Melanoplus acrophilus pachycercus* new subspecies. *Type.* Mountain Lake, Giles County, Virginia.
Fig. 14.—*Melanoplus deceptus* Morse. *Type.* Balsam, North Carolina.
Fig. 15.—*Melanoplus cherokee* new species. *Type.* Crestmont, Haywood County, North Carolina.
Fig. 16.—*Melanoplus delaware* new species. *Type.* Flag Rock Pass, Bath County, Virginia.

PLATE XXIII

(Dorsal view of male supra-anal plate. Figures greatly enlarged.)

Fig. 1.—*Melanoplus delaware* new species. *Type.* Flag Rock Pass, Bath County, Virginia.
Fig. 2.—*Melanoplus tribuloides* Morse. *Paratype.* Cheah Mountain, Alabama.
Fig. 3.—*Melanoplus tribulus* Morse. *Topotype.* Sharp Mountain, Pickens County, Georgia.

(Caudal view of penis.)

Fig. 4.—*Melanoplus beameri* Hebard. *Type.* Leavenworth County, Kansas.
Fig. 5.—*Melanoplus acrophilus acrophilus* Hebard. *Type.* Black Mountain, North Carolina.
Fig. 6.—*Melanoplus deceptus* Morse. *Type.* Balsam, North Carolina.
Fig. 7.—*Melanoplus cherokee* new species. *Type.* Crestmont, Haywood County, North Carolina.
Fig. 8.—*Melanoplus delaware* new species. *Type.* Flag Rock Pass, Bath County, Virginia.
Fig. 9.—*Melanoplus tribuloides* Morse. *Paratype.* Cheah Mountain, Alabama.
Fig. 10.—*Melanoplus tribulus* Morse. *Topotype.* Sharp Mountain, Pickens County, Georgia.

PLATE XXIV

(Figures greatly enlarged.)

Fig. 1.—*Melanoplus olamentke* Hebard. *Paratype.* Male. Lateral outline of cercus. Southern Sonoma County, California.
Fig. 2.—*Melanoplus olamentke* Hebard. *Paratype.* Male. Caudal view of penis. Southern Sonoma County, California.
Fig. 3.—*Melanoplus solitudinis* new species. *Type.* Male. Dorsal view of supra-anal plate. Bryce, Paunsagunt Plateau, Utah.
Fig. 4.—*Melanoplus solitudinis* new species. *Type.* Male. Lateral view of cercus. Bryce, Paunsagunt Plateau, Utah.
Fig. 5.—*Melanoplus solitudinis* new species. *Type.* Male. Caudal view of penis. Bryce, Paunsagunt Plateau, Utah.
Fig. 6.—*Melanoplus calidus* Scudder. Male. Caudal view of penis. Sierra Blanca, White Mountains, New Mexico, at 10000 feet.

Fig. 7.—*Melanoplus femur-nigrum* Scudder. Male. *Paratype.* Caudal view of penis. San Francisco Mountains, Arizona.

Fig. 8.—*Melanoplus femur-nigrum* Scudder. Male. Ten miles east of Flagstaff, Coconino Plateau, Arizona. (Showing individual variation in length of processes of the penis.)

Fig. 9.—*Melanoplus femur-nigrum* Scudder. Male. Lateral view of distal portions of penis, (showing apical specialization which can not be seen in caudal aspect.)

Fig. 10.—*Melanoplus snowii* Scudder. Male. *Topotype.* Caudal view of penis. Magdalena Mountains, New Mexico, at 9900 feet.

Plate XXV

(Figures greatly enlarged.)

Fig. 1.—*Melanoplus snowii* Scudder. Male. *Topotype.* Lateral view of cercus. Magdalena Mountains, New Mexico, at 9900 feet.

Fig. 2.—*Melanoplus magdalenae* new species. Male. *Type.* Dorsal view of supra-anal plate. Magdalena Mountains, New Mexico, at 9900 feet.

Fig. 3.—*Melanoplus magdalenae* new species. Male. *Type.* Lateral outline of cercus. Magdalena Mountains, New Mexico, at 9900 feet.

Fig. 4.—*Melanoplus magdalenae* new species. Male. *Type.* Caudal view of penis. Magdalena Mountains, New Mexico, at 9900 feet.

Fig. 5.—*Melanoplus magdalenae* new species. Male. *Paratype.* Lateral view of distal portion of abdomen. Magdalena Mountains, New Mexico, at 9900 feet.

Fig. 6.—*Melanoplus truncatus* Scudder. Male. *Paratype.* Lateral view of distal portion of abdomen. San Francisco Mountains, Arizona.

Fig. 7.—*Melanoplus truncatus* Scudder. Male. *Topotype.* Dorsal view of supra-anal plate. San Francisco Mountains, Arizona.

Fig. 8.—*Melanoplus truncatus* Scudder. Male. *Topotype.* Lateral outline of cercus. San Francisco Mountains, Arizona.

Fig. 9.—*Melanoplus truncatus* Scudder. Male. Caudal view of penis. San Francisco Mountains, Arizona.

Plate XXVI

(Figures greatly enlarged.)

Fig. 1.—*Melanoplus artemisiae* Scudder. Male. *Topotype.* Lateral view of cercus. Salmon River Mountains near Salmon City, at 4000 feet.

Fig. 2.—*Melanoplus artemisiae* Scudder. Male. *Paratype.* Caudal view of penis. Salmon City, Idaho.

Fig. 3.—*Melanoplus lemhiensis* new species. Male. *Type.* Lateral view of cercus. Cow Creek, Lemhi Range, Idaho.

Fig. 4.—*Melanoplus lemhiensis* new species. Male. *Type.* Caudal view of penis. Cow Creek, Lemhi Range, Idaho.

Fig. 5.—*Melanoplus lemhiensis* new species. Male. *Type.* Lateral view of distal portion of penis, (to show specialization not visible from caudal aspect).

Fig. 6.—*Melanoplus idaho* new species. Male. *Type.* Caudal view of penis. Cow Creek, Lemhi Range, Idaho.

Fig. 7.—*Melanoplus salmonis* new species. Male. *Type.* Lateral outline of cercus. Upper Morgan Creek, Salmon River Mountains, Idaho, at 7080 feet.

Fig. 8.—*Melanoplus salmonis* new species. Male. *Type.* Caudal view of penis. Upper Morgan Creek, Salmon River Mountains, Idaho, at 7080 feet.

Fig. 9.—*Melanoplus washingtonius* (Bruner). Male. *Type.* Caudal view of penis. Loon Lake, Colville Valley, Washington.

Fig. 10.—*Melanoplus repetinus* new species. Male. *Type.* Caudal view of penis. Middle Onion Patch, Strawberry Peak, Oregon, at 8250 feet.

Plate XXVII

(Lateral views magnified approximately 2½ times.)

Fig. 1.—*Melanoplus beameri* Hebard. Male. *Type.* Lateral view. Leavenworth County, Kansas.

Fig. 2.—*Melanoplus similis* Hebard. Male. (*Paratype* of synonym *calloplus.*) Lateral view. Collison Ridge, Bath County, Virginia.

Fig. 3.—*Melanoplus hubbelli* new species. Male. *Paratype.* Lateral view. Red Hills, Franklin County, Ohio.

Fig. 4.—*Melanoplus acrophilus acrophilus* new species. Male. *Type.* Lateral view. Black Mountain, North Carolina.

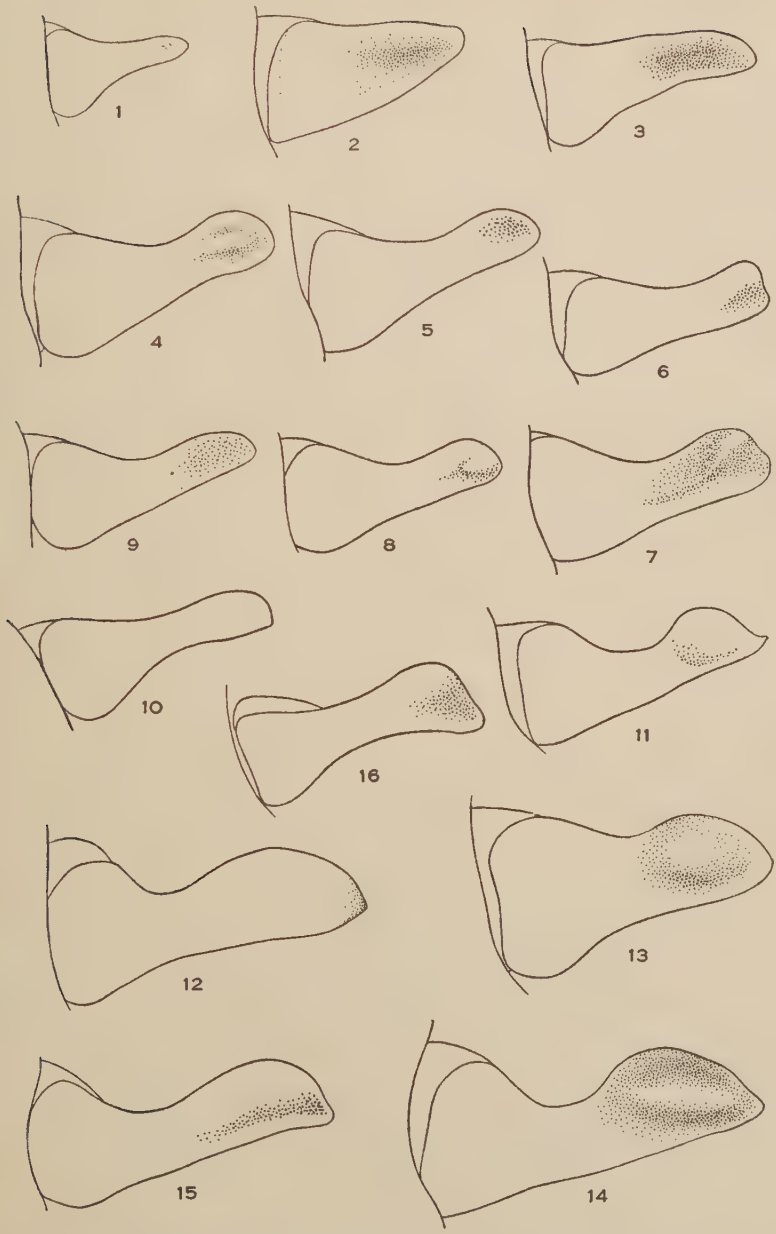
Fig. 5.—*Melanoplus lemhiensis* new species. Male. *Type.* Cow Creek, Lemhi Range, Idaho.

Fig. 6.—*Melanoplus idaho* new species. Male. *Type.* Cow Creek, Lemhi Range, Idaho.

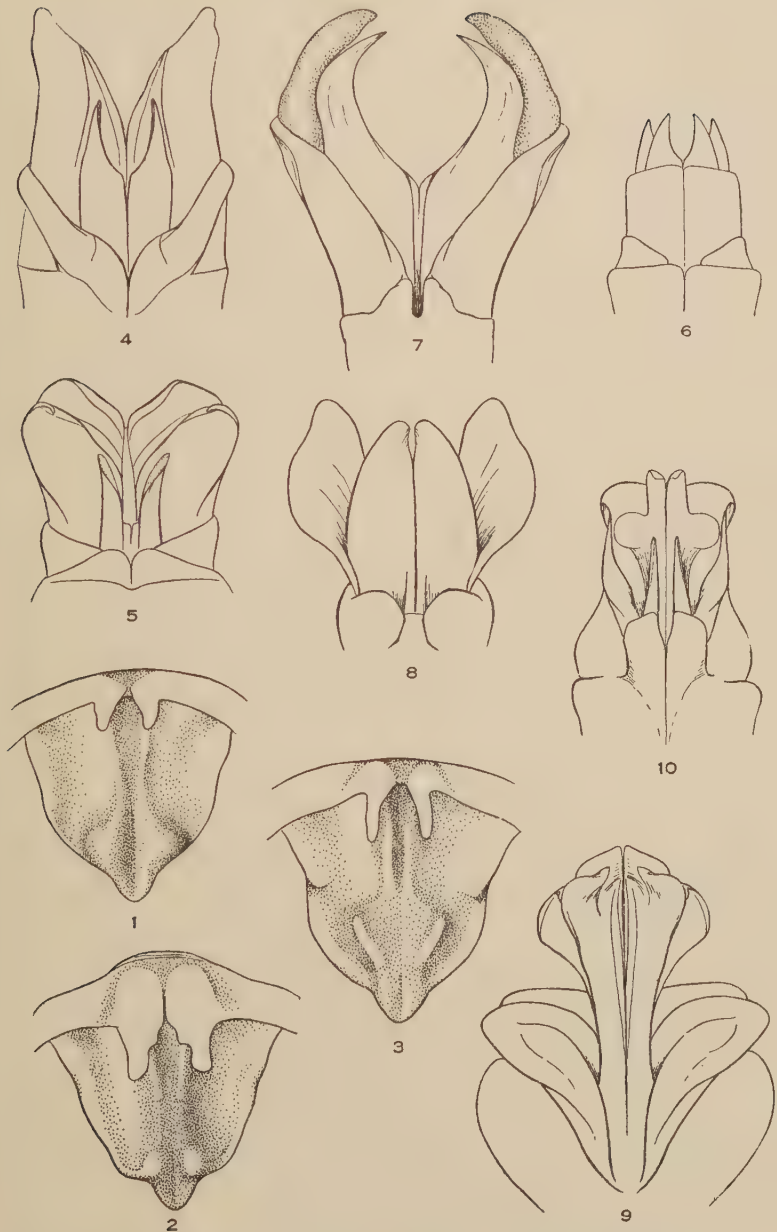
Fig. 7.—*Melanoplus montanus* (Thomas). Male. Summit of Bozeman Mountain, Montana, at 7600 feet. Lateral outline of cercus. (Greatly enlarged.)

Fig. 8.—*Melanoplus idaho* new species. Male. *Type.* Cow Creek, Lemhi Range, Idaho. Lateral outline of cercus. (Greatly enlarged.)

Fig. 9.—*Melanoplus chiricahuae* Hebard. Male. *Topotype.* Chiricahua Mountains, Arizona. Caudal view of penis.



HEBARD—NORTH AMERICAN MELANOPLI



HEBARD—NORTH AMERICAN MELANOPLI

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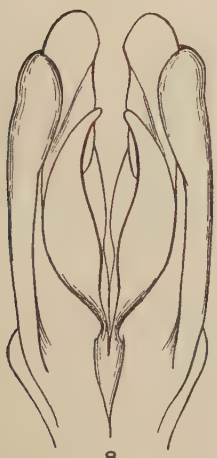

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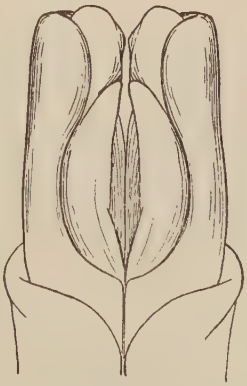

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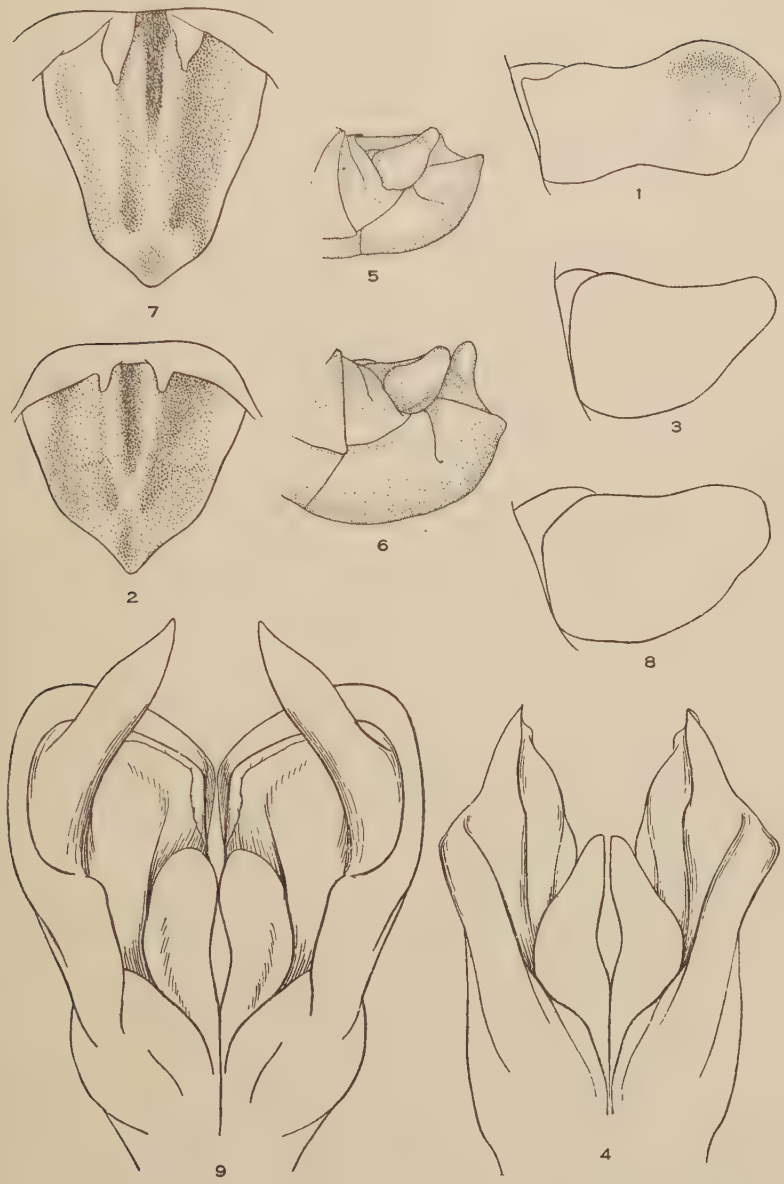

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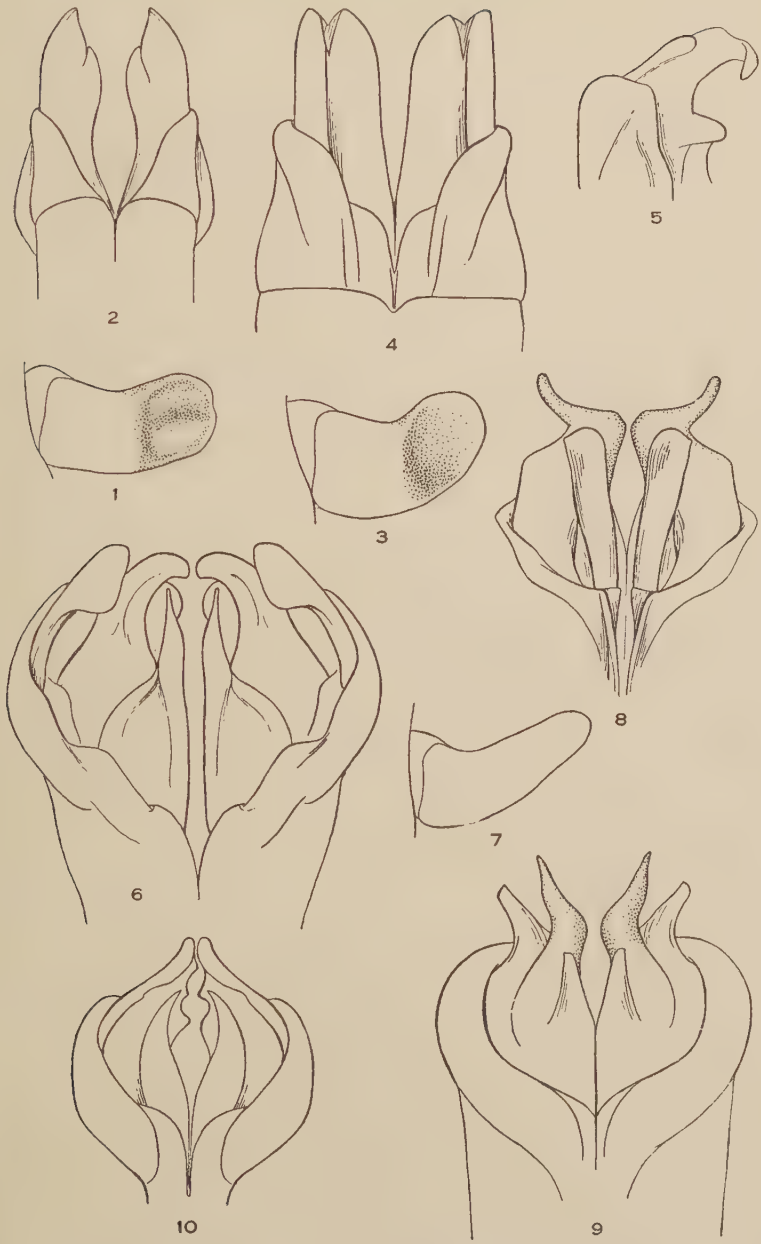

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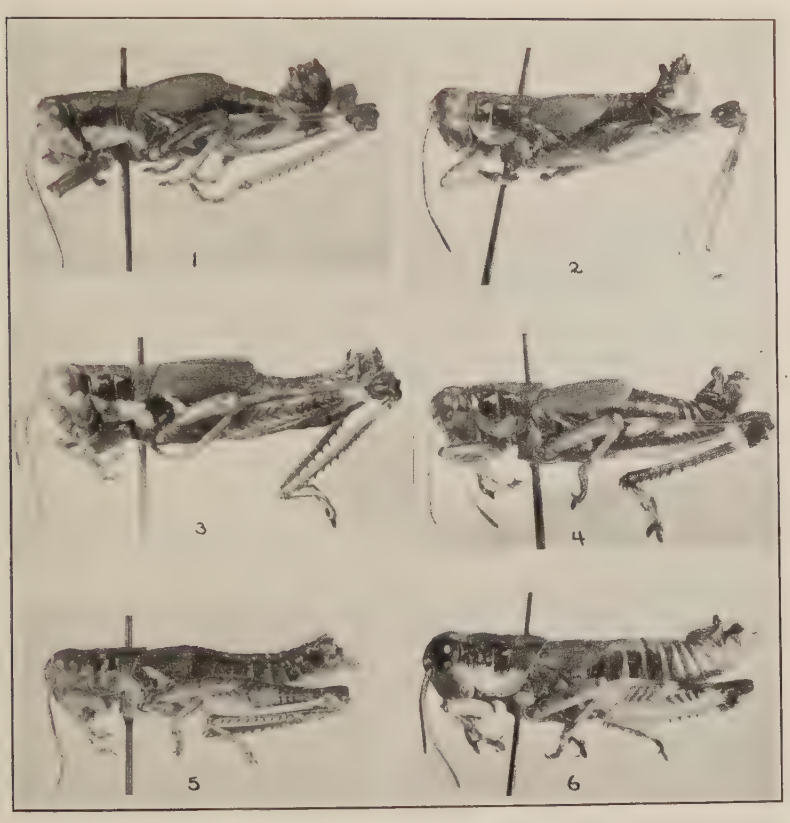

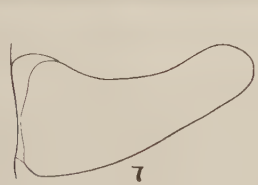

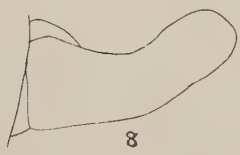

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